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THE UNIVERSITY OF ALBERTA

THE LOCATION REQUIREMENTS AND SPATIAL ORGANIZATION OF FEDERAL SERVICES: THE CASE OF EDMONTON

by

© WILLIAM L. BATEY

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled THE LOCATION REQUIREMENTS AND SPATIAL ORGANIZATION OF FEDERAL SERVICES: THE CASE OF EDMONTON submitted by William L. Batey in partial fulfilment of the requirements for the degree of Master of Arts.

Supervisor

Date Sept. 8, 1976

ABSTRACT

Recently, there has been increased research activity from a number of disciplines into the location requirements of public services. This thesis examines a subset of federal government functions, those of consumer-oriented activities. The physical location requirements of consumer-oriented services, and the spatial organization of services within the central area of Edmonton are identified and described, and a simple method is devised to evaluate the accessibility inherent in the location of federal services.

Federal decision-makers feel that the central area satisfies most of their location requirements, accessibility for clients and staff, proximity to interrelated activities and adequate parking space. On average, services with high levels of personal contact at an office need locations which are accessible to their clients and which are near interrelated federal and provincial activities. Low face-to-face contact services are primarily concerned with the movement of employees, adequate parking space, and proximity to services in the same department.

Few departments have fully developed procedures for selecting central area sites which optimize their location requirements. Indeed, the locational pattern of services is governed by the procedure of office acquisition, leasing, and discard which, in turn, is affected by spatial and functional changes within the central area. Rising land

values, and the relocation of the municipal and provincial governments, and the general office sector force federal services from the CBD into the frame, where low-cost office space is available, but bus service is relatively poor. Relo ation produces important changes in the spatial organization of services. Services are less concentrated and less uniformly distributed than formerly, and this trend is likely to continue.

Using the services of Unemployment Insurance Commission as a case study, the research also reveals that the frame might be a suboptimal location for consumer-oriented services. Low-cost inner city and suburban locations which minimize the total aggregate linear distance clients must travel to facilities can be as accessible as parts of the frame.

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Chapter I

INTRODUCTION

Governmental and institutional land uses account for nearly twenty percent of developed land in the North American city.[1] In fact, Form has argued that government is one of the most influential groups affecting the urban land market and the structure of cities.[2]

Urban inhabitants require daily contact with public services provided by municipal, provincial and federal governments and agencies: education, police and fire protection, and health services, for example. Although government functions pervade the everyday lives of urban residents, location theorists, until recently, have paid scant attention to the spatial properties of government services and locational decision-making by bureaucrats. Usually, government decision-makers choose locations by employing arbitrary rules which are unaccompanied by methods "...to evaluate the results or to stimulate the invention of new systems."[3]

Whereas locational decisions by governments are often approached in a casual manner, evidence has accrued which suggests that these

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[1] Maurice Yeates and Barry Garner, The North American City. New York: Harper & Row, 1971, p. 234. Huebert derived the same value for London, Ontario; see Victor Huebert, Public Land Use in London, Ontario. (unpublished M.A. Thesis), Department of Geography, University of Western Ontario, London, 1967.

[2] W.H. Form, "The Place of Social Structure in the Determination of Land Use: Some Implications for a Theory of Urban Ecology," Social Forces, Vol. 32, 1954, pp. 317-323.

[3] M.B. Teitz, "Toward a Theory of Urban Public Facility Location," Papers, Regional Science Association, Vol. 21, 1968, p. 36.

decisions have considerable impact on the economic, social and structural components of cities. Breese, et al., have recorded several American experiences where decisions to locate or dismantle large military installations have significant economic repercussions on surrounding settlements.[4] In London, Huebert has documented one incident in which a seemingly minor federal decision generated serious conflict, hampered the municipal planning effort, forced zoning changes in a portion of the city's core, and effected the re-routing of traffic on an adjacent arterial roadway.[5] The decision in question was the siting of a single post office.

If the question of locating a single facility is important, the impact of locational decisions for the entire system of government facilities is crucial. To analyse only the efficiency of the locational system, Teitz suggests that the theorist is "...inevitably drawn toward the structure and location of the entire system of facilities..."[6]

CONTRIBUTIONS TO THE STUDY OF PUBLIC SERVICE SYSTEMS

Research on public services is available from several disciplines: geography, economics, operations research and political science. For

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[4]Gerald Breese, et al. The Impact of Large Installations on Nearby Areas: Accelerated Urban Growth. Beverly Hills: Sage Publishers, Inc., 1965.

[5]Huebert, 1967.

[6]Teitz, 1968, p. 38.

the most part this research has been piecemeal, and systematic attempts to develop a theory of public service location are not in evidence. Economists tend to deal primarily with city financing and theoretical discussions on the nature of public services. A fairly large body of literature by political scientists on political processes and behaviour is available. Economists and operations researchers contribute extensively to mathematical solutions of facility location problems. Finally, geographers such as Massam have attempted to understand the relationships between the size and shape of government administrative districts and the efficient provision of public goods and services.[7]

In much of the research a need is expressed for deriving normative guidelines with which to establish and efficient and equitable locational system of facilities. To date, the discovery of relevant locational criteria for public services has been sporadic and unsystematic. Few location models discussed in the literature have been used in real planning situations because of the intractable theoretical and empirical rationale upon which they have been constructed.[8] Without a thorough understanding of the nature and characteristics of public services, their location requirements, and the impact of locational decisions, effective locational planning will continue to be severely hampered.

To solve these problems in their entirety is an exceedingly

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[7]Bryan Massam, Location and Space in Social Administration. London: Edward Arnold, 1975.

[8]Larry J. Shuman, H. Wolfe and R. Speas, "The Role of Operations Research in Regional Health Planning," Operations Research, Vol. 22, No. 2, 1974, pp. 234-245.

complicated task and will require an inter-disciplinary effort from a large body of researchers. On the other hand, individual disciplines have made significant contributions towards an overall solution of the public service problem. Geographical analysis, for example, can provide insight into the spatial properties of public services.

PURPOSE OF THE STUDY

Two interrelated themes are treated in this study. The first concerns the problem of identifying the locational criteria relevant to a selected group of public services in Edmonton: federal consumer-oriented services. Changes in the spatial organization of federal services, the processes governing changes, and the effect of relocation on accessibility to federal offices constitute the second theme.

The Location of Federal Services

Although it is known that most government services are found in the central area of cities,[9] there is little information to explain what specific location requirements, if any, are satisfied by a city centre location. An attempt will be made to resolve the question in the following ways:

1. By questionnaire analysis, to determine the location requirements

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[9]Jean Gottmann, The Evolution of Urban Centrality: Orientations for Research. Oxford: Oxford University, School of Geography, 1974.

which federal decision-makers feel are most important in the selection of an office site for their services.

2. By an application of point pattern analysis and centrographic measures, to identify areal associations between federal services and the location of other central business district activities and land uses.

The primary aim of the questionnaire analysis is to assess the relative importance which decision-makers attach to a fairly comprehensive selection of physical location requirements: land use associations, activity associations, transportation needs, and accessibility. A secondary purpose is to determine the areas of the city which decision-makers feel provide the most satisfactory location for their services.

An ancillary objective is to establish whether respondents' attitudes are based on established planning principles or whether locational decision-making at the federal level is intuitive and based on experience. Taken together, the results of the analysis should provide an indication of those functional relationships which require a definite spatial expression in the efficient provision of services.

Point pattern analysis and centrographic measures applied to the distribution of federal offices will be examined for the period 1915 to 1975. The objectives are to determine changes in the dispersion, and spacing of services; to relate these changes to the areal associations formed between services and other central business district activities; and to derive some measure of the degree to which actual locations satisfy the needs of services as expressed by decision-makers.

Locational patterns are analysed by examining shifts in the centre of gravity of service locations and relating directional properties of spatial change to two reference points, the peak land value intersection and the original focus of government services, the former Edmonton Central Post Office.

Finally, the actual distribution of federal services will be compared with the questionnaire results. The overriding objective in the comparison is to evaluate qualitatively the notion that actual location can be explained by the attitudes of decision-makers and factors inherent in the physical structure of the central business district.

The Location-Allocation Problem for Public Services

Given that accessibility for clients and employees is the most important component of location for most federal services (Chapter IV), the second theme describes how accessibility has been influenced by changes in the spatial distribution of offices and services in Edmonton's central area. Also, a location-allocation model is used to measure the accessibility inherent in the location of central area services provided by one department, Unemployment Insurance Commission.

The model locates the points which minimize the linear distance between clients and the two Unemployment Insurance Commission (UIC) offices in Edmonton. The objective function is the minimization of the linear distance separating demand points from service locations.

Optimal locations are calculated by minimizing the total aggregate linear distance to offices from a set of weighted demand points. The weights represent a measure of equity for the system (Chapter II).

The optimal locations suggested by the model will be compared with the degree of accessibility inherent in actual UIC service locations. The evaluation follows a three-stage procedure:

1. Determine the criteria which, if fully satisfied, would optimize the locational system of UIC services.
2. Derive a set of costs for the locations which optimize one location requirement of UIC, accessibility.
3. Compare the actual and the optimal set of accessibility costs to derive some descriptive assessment of the relative influence of accessibility in the location of UIC services.

The third step in the procedure depends upon an accessibility index. To formulate the index, optimal costs will be measured against actual costs to give a percentage expression of the extent to which actual distance costs are suboptimal. The value of actual costs defines in percent the level of accessibility, or tautologically, inaccessibility innate in the present location of UIC services. The suitability of the technique depends almost entirely upon the theoretical strength of the objective function and the ability of the model to simulate a real world situation.[10]

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[10] Shuman, et al., 1974, pp. 244-245.

By comparing actual location trends and patterns with the distribution of an optimal system of service locations as defined by federal decision-makers it should be possible to identify and partly measure the spatial properties inherent in the activity functions of consumer-oriented services.

The conclusions will not be sufficient to explain completely the location of federal services. It is believed, though, that the study will contribute toward an understanding of the processes which govern the location of consumer-oriented federal services. Ultimately, the purpose of public service research must be to discover laws and to construct theories applicable to the general problem of locating facility systems. Implicit in this expectation is the development of more realistic and workable location-allocation models.

ORGANIZATION OF THE THESIS

Chapter II is a literature review. The review attempts to bring together the salient research on public service location and to emphasize its relevance to the federal service problem. The mathematical properties of location-allocation models are also discussed in the opening chapter. Chapter III describes briefly the methodological perspective adopted in this study, systemic enquiry. Techniques applicable to functional explanation are described, as well as limitations to the study. Data sources and collection problems are presented at the end of Chapter III. In Chapter IV, questionnaire data are

analysed to determine which areas of the city would satisfy, in the minds of decision-makers, the location requirements of their services. The chapter is also concerned with identifying the most important location requirements in accordance with the type of service provided, and the level of face-to-face contact taking place at an office providing the service. The development of the federal service system of locations in the central area of Edmonton is reconstructed in Chapter V and spatial changes are related to the growth of the central business district. Dominant locational trends and areal assocations are treated in detail and a descriptive model which summarizes the principal spatial trends of federal offices and services is presented. The final content section, Chapter VI, is concerned with the influence which the spatial change of federal offices and services in Edmonton's central area has had on accessibility for clients. A location-allocation model derives an optimal location for UIC services and the solution is evaluated against the accessibility inherent in the actual location of UIC services. An overview of the results of Chapters IV, V and VI are tabled for Chapter VII, the concluding chapter. In the final chapter, research topics are suggested, and the contributions made by this study to the public service problem are evaluated.

Chapter II

REVIEW OF LITERATURE

Public service research is extensive, but few studies relate directly to spatial analyses of federal services. Nevertheless, the relevant literature can be divided into three related categories. The first group of studies is concerned with the definition, and theoretical explanation of public goods and services. It is necessary to draw a distinction between public and private services, since some federal departments offer public services, while others are profit-motivated.

The selection of relevant locational criteria is influenced by the nature of the service. It has been argued that classical location theory is not applicable to public service research.[1] Thus, the second body of research involves the identification and measurement of locational parameters and variables important to public facility systems.

Finally, a large amount of research on mathematical and prescriptive location-allocation models is available. The most recent modelling attempts are aimed at the development of locational solutions for actual facility systems. These efforts have been hampered by prohibitive programming costs and the difficult problem of incorporating

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[1] M.B. Teitz, "Toward a Theory of Urban Public Facility Location," Papers, Regional Science Association, Vol. 21, 1968.

qualitative benefits and costs into models.

Practical facility system planning requires suitable models based on relevant and quantifiable locational criteria for the system under consideration. The dearth of research on the locational needs of federal services makes it necessary to review the general literature on public services. This review attempts to identify the characteristics and locational criteria which might be common to all public services. At the same time, programming problems are discussed with the intention of selecting an existing model which will provide a realistic solution for the location requirements of federal consumer-oriented services in Edmonton.

The literature review is divided into three related sections: the nature of public goods and services; the identification and measurement of locational criteria; and location-allocation research. The literature selected for each section focuses on the spatial properties of public services.

THE NATURE OF PUBLIC GOODS AND SERVICES

Locational analyses of public facility system are logically preceded by a discussion of the nature of public goods and services. It has been established that the efficacy of any location-alloction model depends upon the theoretical basis of its objective function and its constraints. That is, the objective function and the constraints must reflect the location requirements of the facility system which is

to be optimized.

Many location-allocation models are based on normative principles from economics which reflect a rational desire to minimize transportation costs or to maximize profits. Non-economic factors, such as political ties or social gains, might also operate to produce public facility location systems, however.[2] Thus, an examination of the lack of correspondence between actual and optimal patterns may disclose decision-making parameters which are not taken into account by the classical economic models. The nature of public goods and services also suggests non-economic criteria which must be included in an evaluation of federal service systems. Towards this end, one must turn to the economic and political science literature.

Samuelson provides the most commonly held notion of a public good, having defined it as:

> ...one which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good.[3]

Samuelson's conception is an ideal, the pure public good. Pure public goods are difficult to find, however, and Breton suggests that they have some private aspects. A public good, according to Breton,

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[2]Edward J. Taaffe and Howard J. Gauthier Jr., Geography of Transportation. Englewood Cliffs: Prentice-Hall Inc., 1973, p. 160; and J.W. Simmons and Victor Huebert, "The Location of Land for Public Use in Urban Areas," Canadian Geographer, Vol. XIV, No. 1, 1970, pp. 45-46; and Teitz, 1968.

[3]A. Breton, "A Theory of Government Grants," The Canadian Journal of Economics and Political Science, Vol. 31, 1965, p. 176.

can be characterized as an intangible or tangible entity "...which, though not available equally to all, has the property that the amount available to one individual does not reduce that available to others by an equal amount."[4]

Some federal services, such as Air Canada, clearly do not fit either definition of a public good. Most other services though, and Unemployment Insurance is an example, come closer to Breton's conceptualization. To prevent analytical difficulties and problems of measurement it is believed that the services selected for analysis should be as similar in nature as possible. For this reason, this thesis focuses on the location requirements and spatial organization of federal services which are more public than private.

Measurement is complicated by the quality characteristics of public services. These traits are difficult to identify as Hirsch warns:

> Defining the basic service unit entails serious conceptual problems, and estimating the number of units produced in a given period is complicated by severe empirical difficulties.[5]

To reduce the empirical problems noted by Hirsch a distinction will be drawn between services whose employees usually travel to the client's place of residence or work to render the service, and those whose clients usually travel to an office to obtain the service. This simple dichotomy does not, of course, entirely solve the problem noted by Hirsch; but it does establish an organizing principle around which

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[4] Ibid.

[5] Werner Z. Hirsch, "The Supply of Urban Public Services," in Harvey S. Perloff and Lowdon Wingo Jr. (eds.), Issues in Urban Economics. Baltimore: The John Hopkins Press, 1968, p. 480.

federal services can be isolated and their location requirements compared.

IDENTIFICATION, DEFINITION AND MEASUREMENT OF RELEVANT LOCATIONAL CRITERIA

Facility system planning for public services is beset by problems relating to the definition and measurement of qualitative locational criteria and the concomitant evaluation of alternative locational strategies. Two principal techniques, cost-benefit and cost-effectiveness analyses, are currently the most favoured approaches. Broadly defined, these techniques are designed "...to evaluate alternative courses of action with the objective of assisting in the identification of the preferred course of action."[6] Good has shown that the problem involves an evaluation between inputs (costs) and outputs (benefits). The strategy selected will be based on 1) a least cost solution, 2) a maximum benefit solution, or 3) some cost-benefit ratio which maximizes the differences between benefits and costs.[7]

Maas stresses that the predominantly monetary interpretation of cost-benefit analysis renders it unsuitable for the complete evaluation of social systems;[8] and Bish reiterates the public choice

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[6] David A. Good, Cost-Benefit and Cost-Effectiveness Analysis: Their Applications to Urban Public Services and Facilities. Regional Science Research Institute, Discussion Paper Series, No. 47, 1971, p. 11.

[7] Ibid., p. 11.

[8] A. Maas, "Benefit-Cost Analysis: Its Relevance to Public Investment Decisions," Quarterly Journal of Economics, Vol. 80, 1966, pp. 208-226.

theorists' criticism that cost-benefit analysis as a normative tool does not enhance prediction of decision-making, especially from differently organized governmental structures.[9]

The performance of cost-effectiveness analysis is restricted by the difficulties involved in formulating operational definitions for broad public service objectives,[10] and in defining the meaningfulness of the criteria chosen for measuring effectiveness.[11]

Regardless of the criticisms levelled at cost-benefit and cost-effectiveness analysis, each contributes in at least three ways to the location problem for federal services. First, critical analysis of the theoretical basis of the two techniques serves to indicate the complex conceptual and empirical difficulties which must be overcome in discovering normative location principles. Second, they make use of normative principles such as equity, an important criterion in the provision of public and non-public goods alike. Last, the structure of cost-effectiveness analysis ensures that non-commensurable or commensurable measures of intangible locational criteria, once determined and measured, can be incorporated into a standard evaluative system.

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[9]Robert L. Bish, "Commentary," Journal, American Institute of Planners, No. 2, 1975, p. 74.

[10]Good, 1971, p. 28.

[11]David S. Fields, "Cost/Effectiveness Analysis: Its Tasks and Their Interrelation," Operations Research, Vol. 14, No. 3, 1966, pp. 515-526.

The Selection of Relevant Allocation Procedures and Locational Criteria

Although cost-benefit and cost-effectiveness techniques can be used to evaluate alternative locational strategies, there must first be a procedure for discovering the locational needs of services and suitable methods for allocating clients to facilities. As one normative procedure for providing public services, Margolis implores researchers "...to explore the model of political organization, and to evaluate the role of groups in influencing allocations and the institutions by which the allocations are made."[12] In a similar context, Good poses two questions which the researcher should attempt to answer:

1. What distributional criteria do decision-makers regard as relevant?
2. Which distributional criteria should they consider?[13]

Following the cues provided by Margolis and Good, a spatial analysis of federal services should perhaps include an investigation into the attitudes of the decision-makers who determine where their services will be located. This analysis will help solve two questions. First, to what extent can the actual spatial system be explained by the needs of services as expressed by decision-makers? Second, are the locational criteria identified by the decision-makers relevant; and if so, to what extent can these criteria be satisfied in a planning situation?

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[12] Julius Margolis, "The Demand for Urban Public Services," in Perloff and Wingo, 1968, p. 535.

[13] Good, 1971, p. 44.

The most acceptable locational criterion for public service location is the minimization of some measure of distance travelled to facilities. Rojeski and Revelle for example, have examined the particular problem in which convenience and necessity are key considerations for clients who must travel to facilities. They have noted that "...the distance to a facility becomes especially critical in areas where transportation is lacking or where the level of living is substandard."[14]

UIC clients are representative of the type of client to which Rojeski and Revelle have referred. Location problems for facilities with service thresholds based on time or distance constraints have also been explored by Toregas and Revelle, Schneider and Symons, and Schaefer and Hurter, among others.[15]

Wagner and Falkson, and Holmes, et al. examine similar constraints and consider two categories of services: clients are free to use an existing facility; and clients are assigned to a facility.[16]

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[14] P. Rojeski and C. Revelle, "Central Facilities Location Under an Investment Constraint," Geographical Analysis, Vol. II, No. 4, 1970, p. 348.

[15] C. Toregas and C. Revelle, "Optimal Location Under Time or Distance Constraints," Papers, Regional Science Association, Vol. 29, 1972, pp. 133-143; Jerry B. Schneider and John G. Symons, Regional Health Facility Systems Planning: An Access Opportunity Approach. Regional Science Research Institute, Discussion Paper Series No. 48, 1971; and M.K. Schaefer and A.P. Hurter Jr. "An Algorithm for the Solution of a Location Problem With Metric Constraints," Naval Research Logistics Quarterly, Vol. 21, 1974, pp. 625-635.

[16] J.L. Wagner and L.M. Falkson, "The Optimal Nodal Location of Public Facilities with Price-Sensitive Demand," Geographical Analysis, Vol. VII, No. 1, 1975, pp. 69-83; and John Holmes, Forrest B. Williams, and Lawrence A. Brown, "Facility Location Under Maximum Travel Restriction: An Example Using Day Care Facilities," Geographical Analysis, Vol. IV, No. 3, 1972, pp. 258-266.

Clients of UIC fall into the second type. For clients who are assigned by fiat, it is not necessary to use a location-allocation model which would consider the movement of clients across service area boundaries. Thus, a fairly simple location model can be used in the case of the Unemployment Insurance Commission offices.

All location-allocation studies recognize distance as a barrier to the use of a service provided at a facility. For example, several types of decay functions have been used to describe the inverse relationship between distance to medical facilities and utilization of those facilities. Abernathy and Hershey solve the problem using four different criteria: 1) maximum utilization where interaction is greatest when the population is concentrated near the facility; 2) minimum distance per capita; 3) minimum distance per visit; and 4) minimum average reducation in the number of visits individuals make as a percentage of the visits made if they were in the immediate proximity to a facility.[17] The problems were solved for three hypothetical cities and the resulting locations differed widely for each objective function. They showed that it is impossible to satisfy simultaneously all objective functions. If goals conflict, then a specification of the most relevant objective function or a combination of objective functions for a particular system is important.

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[17]W.J. Abernathy and J.C. Hershey, "A Spatial Allocation Model for Regional Health Services Planning," Operations Research, Vol. 20, No. 3, 1972, p. 629.

The measure of distance chosen reflects the suitability of the model. Location theory has traditionally used the Euclidean metric in order to represent geographic distance. Perreur and Thisse introduce three new metrics: 1) radial, 2) circumferential, and 3) circumradial.[18] In each metric, movement occurs along rays and each is designed for facility location in cities with transportation networks and street patterns similar to the metric. Wesolowsky produced an algorithm which uses rectangular distance, suitable for road patterns laid out on the grid system.[19]

Angel and Hyman approach the distance problem from a mathematical perspective by transforming urban space into a velocity field.[20] Travel times are estimated for any location in a radially symmetric velocity field. The Euclidean straight-line distance is used most frequently by researchers, however. Massam, for one, feels that linear distance is fairly accurate representation of actual distance travelled in urban areas which are laid out on a grid system.[21] Nevertheless, the

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[18] J. Perreur and J. Thisse, "Central Metrics and Optimal Location," Journal of Regional Science, Vol. 14, No. 3, 1974, pp. 411-421.

[19] G.O. Wesolowsky, "Rectangular Distance Location Under the Mimimax Optimality Criterion," Management Science, Vol. 6, No. 2, 1972, pp. 103-112.

[20] S. Angel and G. Hyman, "Urban Travel Time," Papers, Regional Science Association, Vol. 21, 1971, pp. 85-99.

[21] Bryan Massam, Location and Space in Social Administration. London: Edward Arnold, 1975.

suitability of the distance technique employed is totally dependent upon the relevance of that criterion to the problem under consideration.

The Theoretical Basis of Operational Definitions

In order to identify operational definitions for locational variables, it is necessary to turn to the numerous case studies which have been undertaken, and to their theoretical underpinnings. Two approaches are most commonly followed: utility functions and maximizing accessibility.

Smolensky, Burton and Tideman employ the economic concept of utility to arrive at an optimal solution to the location-allocation problem.[22] Wagner and Falkson use the same concept, but instead of finding optimal locations on a planar surface, they consider a general model for locations in a nodal network.[23] In both studies, recognition is given to declining demand functions with the objective of maximizing a welfare function based on the individual's willingness to pay for a given level of service.

Brown et al., using the example of day care centres, identify accessibility as the relevant locational criterion, although they note

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[22] Eugene Smolensky, Richard Burton and Nicholaus Tideman, "The Efficient Provision of a Local Non-Private Good," Geographical Analysis, Vol. 2, No. 4, 1970, pp. 331-341.

[23] Wagner and Falkson, 1975.

that this will vary from case to case.[24] Unfortunately from the viewpoint of federal services, most locational strategies have been produced for health services, hospitals and other emergency services. From these studies have been generated a number of location-allocation models with limited applicability to federal service locations. Much of the research, especially that related to hospital and health services has "...naively minimized distance or travel time without considering behavioural variables or cost factors."[25]

The literature on health services and hospitals has been criticized with some justification. On the other hand, the conceptual and measurement problems encountered in health care research have a direct bearing on the analysis of federal services. This is true in particular for the case of accessibility, one of the most important location requirements of federal services (Chapter IV).

The Measurement of Accessibility

Accessibility is usually measured as the linear distance, time distance, or cost distance separating points. More complex measures have been attempted recently, but time and cost factors inhibit practical applications. The bulk of research on location-allocation

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[24] Lawrence A. Brown, Forrest B. Williams, Carl E. Youngman and John Holmes, Day Center in Columbus: A Locational Strategy. Department of Geography, Ohio State University, Discussion Paper Series, No. 26, 1972, pp. 3-8.

[25] Larry J. Shuman, J. Wolfe and R. Speas, "The Role of Operations Research in Regional Health Planning," Operations Research, Vol. 22, No. 2, 1974, p. 238.

research has been oriented towards empirical studies and mathematical and programming solutions to distance problems.

In a classic study, Yeates derived the optimal location of students bused to school in Grant County, Wisconsin, by minimizing total travel time.[26] Yeates' study, and the work of Tornquist in Sweden,[27] appear to have exerted considerable influence on case studies undertaken by geographers. It is possible that the impact of earlier research was more a function of the development and use of efficient programming techniques for minimizing distance than an overt recognition that linear distance by itself is the only important variable in location-allocation problems. In fact, the geographic literature on location-allocation research suggests that researchers are continually improving upon the notion of accessibility and developing more realistic operational definitions.

In Sweden, Godlund used total travel time to determine the optimal location for two major hospitals.[28] In Chicago, Earickson used a linear programming technique to minimize the aggregate distance travelled to hospitals; but in a later study, he combined with Morrill

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[26] Maurice H. Yeates, "Hinterland Delimitation - A Distance Minimizing Approach," The Professional Geographer, Vol. XV, No. 6, 1963, pp. 7-10.

[27] Gunnar Tornquist, Transport Cost as a Location Factor for Manufacturing Industry: A Method to Calculate in Data Machine the Regional Variations in Transport Costs for Different Types of Manufacturing Industries. Lund Studies in Geography, No. 23, Lund: Gleerup, 1962.

[28] R. Abler, J.S. Adams and P. Gould, Spatial Organization. New Jersey: Prentice-Hall, 1971, p. 535.

to incorporate a measure of social distance in determining hospital locations.[29] The weightings they used to represent social distance were arbitrary, but they did recognize the inequalities which exist among consumers' abilities to use facilities.

In yet another example Mahadev and Rao present a general model for providing a variety of neighbourhood services in Mysore, India.[30] They framed their problem in an accessibility context where the amount of accessibility was found to be associated with a unit increase in the number of trips per day to each facility. They concluded that it is necessary to study accessibility to individual services. Their observations tend to support Brown et al. who, it has been noted earlier, argued that it will be difficult to develop a general location-allocation model. For this reason, most models are developed for a particular facility system.

Political and Social Variables

Recently, some authors have suggested concepts which, if substantive, could lead to a general model for a limited range of public service systems. Symons, for example, suggests modifications to

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[29] Pierre de Vise, Misused and Misplaced Hospitals and Doctors: A Locational Analysis of the Urban Health Care Crisis. Commission on College Geography, Resource Paper No. 22, Washington, D.C.: Association of American Geographers, 1973, pp. 61-63.

[30] P.D. Mahadev and R.K. Rao, "Model for Location of Service Facilities in a Non-Western Urban Environment," in M. Yeates (ed.), Proceedings, 1972 IGU Commission on Quantitative Geography, Montreal: McGill-Queens University Press, 1974, p. 181.

existing models which "...would attempt to recognize the spatial discrimination implicit in the assignment of population to facility locations."[31] In the same paper, Symons developed a model that establishes a measure of the spatial opportunities innate in any location. Later, Symon's ideas were operationalized and incorported five factors:

1. the size of the facility;
2. travel time from the consumer's place of residence to the facility;
3. waiting time at the facility;
4. entry restrictions; and
5. the perception of the quality of service and benefits derived from using a particular service.[32]

Whereas numerous attempts have been made to formulate more realistic models of public service utilization, few of these have been used in actual planning situations. Shuman et al. suggest why location models have not been successful in health care planning:

1. many researchers have not integrated themselves into the planning system.
2. many researchers view the system as abstract from the viewpoint of an objective scientific observer, and ignore the system's political, social and dynamic traits.[33]

There are signs that some researchers recognize the difficulties that Shuman et al. have pointed out, and recent trends suggest greater

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[31] John G. Symons, "Some Comments on Equity and Efficiency," Antipode, Vol. 3, No. 1, 1971, p. 62.

[32] Schneider and Symons, 1971.

[33] Schuman, et al., 1974, p. 244.

emphasis is being placed on political, social and dynamic variables. This body of literature is relevant to this study because specification of the objective function derived for public systems wherein clients are assigned by fiat explictly requires the direct involvement of federal decision-makers. Identification of the most suitable locational criteria enhances the applicability of models and the effectiveness of the planning process itself. As Wheaton, for example, points out:

> ...higher levels of government are pursuing segmental, separate, and often conflicting ends through policies whose actual effects are very rarely scrutinized systematically. If there could be agreement among these bureaucracies regarding first, the facts; second, the trends with which policy must deal; and third, the standard signals which ought to be operative, these facts, trends, and standard signals would be rapidly communicated to the public and private agents of development...[34]

Wheaton was talking about bureaucracy in America, but it is likely that the same problems exist in Canada. Thus location-allocation models based on suitable standards could enhance the decision-making process and contribute to policy formation.

Value Judgements Involved in the Choice of Locational Criteria

Optimizing models seek an extremum solution defined as the minimization or maximization of some clearly specified objective function. The objective function should reflect the policies and

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[34] William L. Wheaton, "Public and Private Agents of Change in Urban Expansion," in Melvin M. Webber et al. Explorations into Urban Structure. Philadelphia: University of Pennsylvania Press, 1964, p. 191.

standards of the implementing body. In the present study, optimality is determined largely by federal decision-makers; but, the researcher too, cannot avoid a commitment to value judgement and to the formation of policy.

In fact, several geographers have suggested that the discipline ought to become more relevant by acting in an advisory capacity for central and local government. Coppock, for example, feels that policy-oriented research by geographers would be beneficial to the discipline,[35] and Hall's prognostication is for the urban political geographer to "study how different agents in the decision process interact, how they form alliances and coalitions, how they bargain, promise or threaten each other to obtain objectives.[36]

Buttimer, in a general context, has urged all social scientists to examine our efficiency-oriented perspective on human society because we have come to view public services for example, "...as a rationally ordered network of supply systems, rather than responses to a different surface of population demand."[37] David Harvey, perhaps the most vocal critic of the efficiency based system of public goods and services,

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[35] J.J. Coppock, "Geography and Public Policy: Challenges Opportunities and Implications," Transactions, Institute of British Geographers, No. 63, 1974, p. 1.

[36] P. Hall, "The New Political Geography," Transactions, Institute of British Geographers, No. 63, 1974, p. 51.

[37] Anne Buttimer, "Health and Welfare: Whose Responsibility?" Antipode, Vol. 13, No. 1, 1971, p. 32.

has outlined more equitable methods of redistributing public wealth.[38]

Whereas Buttimer stated that public services should be supplied according to demand, Harvey feels that public funds should be allocated on the basis of need. Regardless of the criteria eventually chosen as the mechanism for redistribution, most authors recognize equity as an element in the system to be maximized.

Efficiency and Equity. The location of the industrial firm forms the theoretical basis of most location-allocation models. Consequently, the variables and parameters used in the models are oriented towards maximizing efficiency, usually, by finding the lowest transportation costs of movement from one set of points to another. The models are flexible enough, however, to permit the substitution of non-economic for monetary values. It is possible, for example, to substitute measures of accessibility or equity in place of production costs by weighting the distance function and the supply points, respectively. Substituting values in this manner is not an entirely satisfactory approach for deriving optimal spatial systems for non-economic systems. The models remain grounded in two dimensional Euclidean space, and computer derived solutions are determined primarily by minimizing the linear distance function, an approximation of transportation costs. The models assume a normative equilibrium state which does not

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[38] David Harvey, Social Justice and the City. London: Edward Arnold, 1973.

adequately reflect reality. Specifically, the models assume that the system is static, and that the client population has homogeneous needs and behaves rationally. As a result of these shortcomings, economic models, when applied to systems of public facilities will "...fail to achieve the desired goal of minimizing the total social disutility inherent in the provision of a good or service."[39] Hamilton has criticized the economic model of industrial location for providing an incomplete explanation of economic systems. Specifically, he notes that the models contain no behavioural explanation, and assume that transportation costs are proportional to distance. Furthermore, some models make use of linear programming techniques which sometimes result in complex methods being applied to over-simplified situations for intuitively obvious products.[40]

In most instances, efficiency of client movement is a single criterion solved for a static system. For federal services, where budget constraints limit the size and number of facilities, efficiency is a desirable component to maximize. Nevertheless, efficiency is neither the raison d'etre of the entire federal service system nor does it account for the behaviour of the clients who use a federal service.

Harvey has argued that accessible facilities and services

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[39] Symons, 1971, p. 58.

[40] F. Ian Hamilton, "Models of Industrial Location," in R.J. Chorley and P. Haggett (eds.), Models in Geography. London: Methuen & Co. Ltd., 1967, p. 372.

increase the use value of the place of residence and, moreover, that the friction of distance is a function of income.[41] For persons receiving unemployment benefits, the friction of distance is magnified because less income is available, relative to the employed population, for transportation. For UIC clients, then, efficiency should be maximized.

The level of benefits and the period of dependency upon unemployment insurance earnings are not the same for all recipients, however. To maximize efficiency for the system would fail to consider these variables. It is necessary, therefore, to ensure that the system is just, by incorporating an equity component in the location-allocation model. The disparity between benefits received by an unemployed person and the number of dependents claimed influences his welfare. Normative models should include some measure to account for these differences. Otherwise the system will be, in a spatial sense, located unfairly.

It is generally accepted that governments should attempt to promote equity or any social welfare function.[42] For federal services, then, the lack of equity in the supply and location of facilities represents a dehumanizing situation that should be eliminated. Implicit in these ideas is a problem of decision. Which policies are fair and respresentative of the general public?

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[41] David Harvey, Society, the City and the Space Economy of Urbanism. Commission on College Geography, Resource Paper No. 18, Washington, D.C.: Association of American Geographers, 1972.

[42] Kurt Baier, "Welfare and Preference," in Sidney Hook (ed.) Human Values and Economic Policy. New York: New York University Press, 1967, p. 130.

Defining a suitable operational definition for equity poses serious problems. Adequate measures will involve ethical and moral questions. Although scientific enterprise is open-minded, Kuhn has argued, the individual often is not and knows beforehand what he wants to find.[43]

Rudner and Nagel have extended Kuhn's argument to emphasize that scientists necessarily make value judgements when they assign probabilities which determine the acceptability of hypotheses.[44] In an objective science, value judgements are undesirable; but they can play an important role in the discovery of new paradigms.[45] In this sense, geographers qua geographers might discover new paradigms for evaluating urbanism by adhering less rigidly to an efficiency ethic and moving toward a more humanizing view of society.[46]

It is one thing to accept that equity is a worthwhile concept to build into a system of public services; it is quite another thing to define an appropriate operational definition of equity. One of the

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[43]Thomas S. Kuhn, "The Function of Dogma in Scientific Research," in Barach S. Brody (ed.), Readings in the Philosophy of Science, Englewood Cliffs: Prentice-Hall Inc., 1970, pp. 356-371.

[44]Richard S. Rudner, "The Scientist Qua Scientist Makes Value Judgements," in Brody, 1970, pp. 540-545; and Ernest Nagel, "The Value-Oriented Bias of Social Inquiry," in May Brodbeck (ed.), Readings in the Philosophy of the Social Sciences. New York: MacMillan Company, 1968, pp. 98-113.

[45]Kuhn, 1970.

[46]David Harvey, "What Kind of Geography for What Kind of Public Policy?" Transactions, Institute of British Geographers, No. 63, 1974, pp. 20-22.

more common measures is income per capita. Harvey, for example, notes that "Cities are areally localized resource systems in the sense that most of the resources we make use of occur in fixed locations and their availability is therefore a function of their accessibility."[47] Usually, resource location produces an inequitable distribution because the site of the facility favours certain groups while disadvantaging others. Assuming that differences in income per capita can be used as a measure of inequity,[48] and that accessibility is a function of income, it can be argued that equity is a function of accessibility and therefore can have spatially defined properties. Defined as the data points for an objective function, a linear programming model could be used to optimize equity as an expression in which accessibility from inequitable points to federal service locations relative to points with higher equity, is maximized. That is, the input data would consist of points weighted by values expressive of the inequity inherent in the location of each client relative to the facility location.

The model would provide a precise Euclidian relationship between the weighted points and the facility location; but there is no theoretical base from which to explain the reason for the relationship. The best that can be done, short of defining an equity surface and analysing its mathematical properties, is to estimate the relative inequity inherent in the location of clients instead of the location of the

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[47] Harvey, 1972, p. 25.

[48] Reiner, 1974.

facility itself. The location of clients can then be weighted and the location of the facility shifted a distance proportional to the weighted points.

Inequity can also arise when distance is a key element in the use or effectiveness of a service, but those who have greater need of the service are disadvantaged because of their location relative to the location of the facility. The problem is to devise a measure of need and to determine the mathematical relationship between need and distance. For UIC services, need is defined in accordance with areas that persistently contain large numbers of unemployed persons (ChapterVI). The problem is therefore to increase equity by decreasing the distance which clients with greater need must travel to reach an office.

In this study, a measure of equity is achieved by using a heuristic location-allocation model in which the input data consists of a set of weighted cells. The number of clients contained within each cell expresses the relative inequity inherent in the location of clients. The model finds the locations which minimize the total aggregate linear distance from the weighted cells. Although Symons has argued that it is impossible to maximize simultaneously both equity and efficiency (Figure 1), the definition of equity adopted in this study is synonymous with efficiency.

Figure 1 posits a direct relationship: as the level of equity increases, the level of efficiency decreases. Presumably, the objective should be to determine the locations which compromise on efficiency and

equity. The importance of each criterion would vary with the trade-offs which decision-makers are willing to make. In the case of UIC services, the amount of equity and efficiency in the present system is limited by the number of facilities; but as the level of equity in the present system is increased, efficiency also increases.

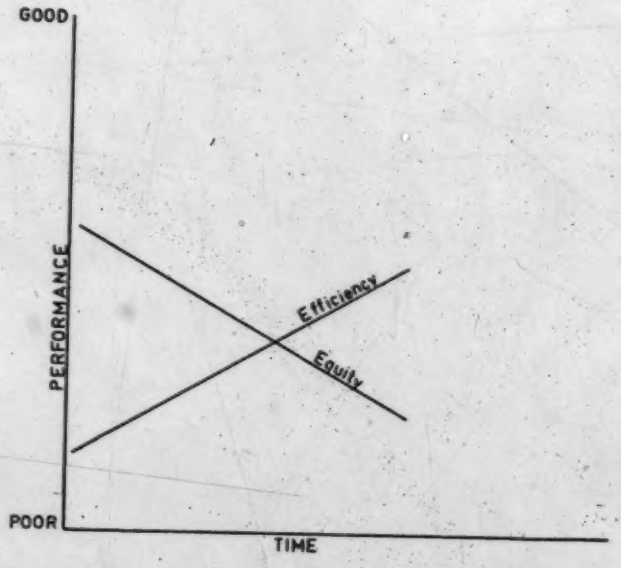

Fig. 1: The effect of increasing equity on efficiency.

After Jerry B. Schneider and John G. Symons, Jr., Regional Health Facility System Planning: An Access Opportunity Approach. Regional Science Research Institute Discussion Paper Series, No. 48, 1971, p. 69.

LOCATION-ALLOCATION MODELS IN PUBLIC SERVICE RESEARCH

The location-allocation problem is of intellectual and pragmatic interest. It contains four interrelated problems. These can be reduced and isolated from the general form of the problem which is to determine the optimal location of m indivisible points and the optimal assignment of movement from n points to the m centroids:

1. Determine the number of facilities.
2. Determine the location of sites for those facilities.
3. Determine the size of each facility.
4. Determine the allocation of clients to the facilities.[49]

Location-allocation models are reducible to two basic models: the Weberian location problem; and the transportation problem of linear programming. In the former, the assignment of flows is known, but the location of the central facilities is unknown. The transportation problem, on the other hand, is to determine the optimal assignment of flows from a set of points to central facilities whose locations are given. Individually, these two problems are not difficult to solve; but, combined as the location-allocation problem, complex and costly computer programs are often necessary, depending on the size of the problem, the nature of the objective function, and the complexity and number of constraints imposed upon the system.

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[49] S. Eilon, C.D.T. Watson-Grany, and N. Christofides, Distribution Management: Mathematical Modelling and Practical Analysis. London: Griffin, 1971, p. 7.

The Location Problem

Location models have a lengthy history dating back to Fermat in the seventeenth century. Fermat's statement on the purely geometrical properties of the problem was: "Given three points on the plan, find a fourth point such that the sum of its distances to the three given points is a minimum."[50]

As an applied problem, Saunhardt (1882) developed a location triangle in which the shortest linear distance from the three vertices representing raw material and market locations to a unique point inside the triangle represented the optimal location for a given factory.[51]

The location problem as it is now known was stated by Weber (1909) and incorporated the concept of weighted distance as well as the use of isodopanes and a location triangle. His work marks the first important departure from traditional geometric solutions. The Weberian location problem is to find the location of a single central facility that minimizes the total cost of movement between the facility location, raw material sites, and the market. This location, the point of minimum aggregate travel time is usually calculated in two dimensional Euclidean space. The point of minimum aggregate travel calculated in Euclidean geometry is usually based on the familiar Pythagorean theorem.

The location problem is to find the Cartesian coordinates U* and V* of the central facilities which minimize the weighted Pytagorean

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[50] G.O. Wesolowsky, "Location in Continuous Space," Geographical Analysis, Vol. V, No. 2, 1973, p. 97.

[51] Hamilton, 1967, p. 362.

function.[52] Schaefer and Hurter provide a mathematical proof to show that the objective function for the Weber problem is strictly increasing in each weight except for the points which are also the optimal locations.[53] Thus,

$$Z = \sum_{i=1}^{m} \sum_{j=1}^{n} r_j \left[(U_i^* - u_j)^2 + (V_i^* - v_j)^2 \right]^{1/2} \qquad (1)$$

where Z = the value of the objective function

(U_i^*, V_i^*) = the Cartesian coordinates of the ith central facility

r_j = the requirements of the jth destination point or region

(u_j, v_j) = the Cartesian coordinates of the jth destination point

n = the total number of points or regions.

m = the total number of facilities.

In (1) distance and movement costs are directly proportional. The solution makes use of calculus such that (1) is minimized where the two simultaneous equations are satisfied:

$$\frac{\partial Z}{\partial U_i^*} = \sum_{i=1}^{m} \sum_{j=1}^{n} r_j \frac{2(U_i^* - u_j)}{\left[(U_i^* - u_j)^2 + (V_i^* - v_j)^2 \right]^{1/2}} = 0$$

$$\frac{\partial Z}{\partial V_i^*} = \sum_{i=1}^{m} \sum_{j=1}^{n} r_j \frac{2(V_i^* - v_j)}{\left[(U_i^* - u_j)^2 + (V_i^* - v_j)^2 \right]^{1/2}} = 0$$

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[52] The notation and symbols used in the equations for the location and transportation problems are from A.J. Scott, "Location-Allocation Systems: A Review," Geographical Analysis, Vol. 2, No. 2, 1970, pp. 96-116.

[53] Schaefer and Hurter, 1974, p. 622.

Again, distance and movement costs are assumed to be proportional. This is not usually the case in a real transportation system,[54] where the relationship of transportation costs (t) to distance (d) will usually be of the form

$$t = \mu d^{\rho} \tag{4}$$

where μ = a given statistical parameter

ρ = a given statistical parameter

The objective function now becomes:

minimize

$$Z = \mu \sum_{i=1}^{m} \sum_{j=1}^{n} r_j \left[(u_i^* - u_j)^2 + (v_i^* - v_j)^2 \right]^{\frac{1}{2}\rho} \tag{5}$$

with the implied conditions that $\mu > 0$ and $\rho \geq 0$.

The relationship of t to d depends on the magnitude of the parameter p (Fig. 2). The most likely relation of t to d in a real transportation system would be given by $p < 1$ where transportation costs decline with distance.[55] If $p \geq 1$, the solution to (5) derives a unique point, the global minimum for the full problem. In real world planning situations, it might not be necessary to determine the global minimum. Cooper has shown that the convex hull of the solution space tends to have a flat

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[54] Michael E. Eliot Hurst, A Geography of Economic Behaviour: An Introduction. North Scituate, Mass: Duxbury Press, 1972, p. 167.

[55] Scott, 1970, p. 99.

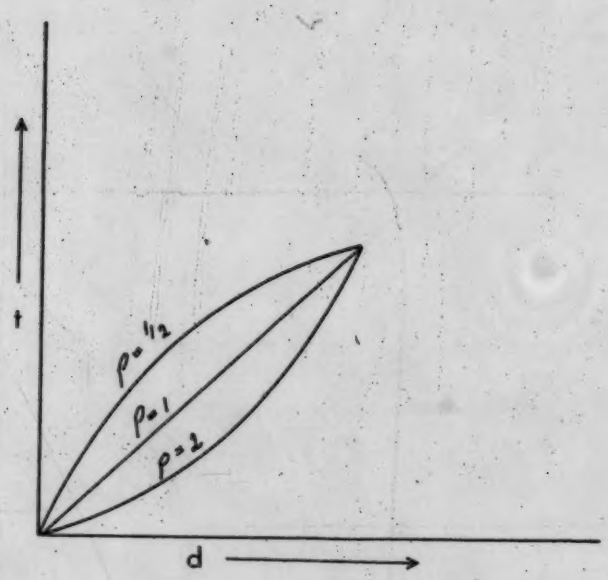

Fig. 2: Relation of Transportation Cost (t) to Distance (d).

(Source: Leon Cooper, "Solutions of the Generalized Weber Problem," Journal of Regional Science, Vol. 8, 1968, pp. 181-198.

minimum (Figure 3).[56] A range of near optimal locations exist which can be used by planning bodies to permit the evalutation of alternative sites on the basis of other criteria.

A suboptimal location chosen within the range of optimal locations could result in only a small reduction in savings. Alan Pearman, in fact, has recently argued for detailed study of the potential planning significance represented by suboptimal solutions to

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[56] Leon Cooper, "Solutions of the Generalized Weber Problem," Journal of Regional Science, Vol. 8, 1968, pp. 181-198.

a represents the range of locational optima

Fig. 3: The range of locational optima within the convex hull.

the transportation problem:[57] He proffers two reasons:

1. optimizing models are based on a simplified single decision criterion which does not take into consideration other important locational requirements of the system; and

2. the complexities of real-life situations often call for viable alternative locations which can be best searched for by heuristic rather than exact solutions.[58]

The Transportation Problem

The transportation problem, known alternatively as the fixed-point problem in geography,[59] is to find for a social system the lowest

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[57] Alan Pearman, "Suboptimal Solutions to Spatial Problems," The Canadian Geographer, Vol. XLX, No. 2, 1975, pp. 159-162.

[58] Ibid., pp. 159-160.

[59] P. Haggett and R.J. Chorley, Network Analysis in Geography. London: Edward Arnold, 1969, pp. 204-255.

total cost of movement from n population points or regions to a set of m central facilities whose locations are fixed and known. The objective function is to minimize

$$Z = \sum_{j=1}^{m} \sum_{i=1}^{n} d_{ij} X_{ij} \qquad (6)$$

where X_{ij} = the unknown assignment of flows between the ith source and the jth destination

and d_{ij} = the linear distance between i and j.

The objective function is subject to three basic constraints:

$$\sum_{i=1}^{n} X_{ij} \leq q_j \qquad (j = 1, 2, \ldots, m) \qquad (7)$$

which states that the sum of flows from the i population points cannot exceed the capacity of the jth central facility (q_j);

$$\sum_{j=1}^{m} X_{ij} \geq r_i \qquad (i = 1, 2, \ldots, n) \qquad (8)$$

which states that the flow of persons to the jth central facility must be at least equal to the population demand of the ith point (r_i); and the non-negativity assumption

$$X_{ij} \geq 0 \qquad (9)$$

In this model, flows are explicitly directed toward the set of central facilities. In some cases the location problem and the transportation problem are combined to form the location-allocation problem.

Location-Allocation Solutions

Several programming techniques are available for solving location-allocation problems. Analytical techniques provide global solutions, but they are costly when the problem under examination is large. Heuristic methods are more commonly employed, and they can be fairly accurate.

Heuristic procedures for solving the location-allocation problem have been developed independently by at least two persons, Tornquist and Cooper.[60] Other heuristic programs are available but they are all similar.[61] The heuristic programming technique used to determine optimal locations for the UIC offices in Edmonton is the one developed by Tornquist and later modified by Nordbeck and Rystedt.[62] Their program is for discrete point sets and the objective function is to find the locations which minimize the total aggregate linear distance from a set of weighted demand points. Hence, the program suffers from many of the limitations discussed earlier. The program assumes that the number of facilities is known beforehand, and each facility has an unlimited capacity. The program cannot be used to establish an actual facility system, because it takes only the distance variable into account. For

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[60] Scott, 1970, p. 112.

[61] A.J. Scott, Dynamic-Location-Allocation Systems. Department of Geography, University of Toronto Discussion Paper #3, 1969.

[62] Stig Nordbeck and Bengt Rystedt, "Computer Cartography: A Multiple Location Program," in G. Tornquist, P. Gould, S. Nordbeck, and B. Rystedt (eds.), Multiple Location Analysis. Lund Studies in Geography, Lund: Gleerup, 1971, pp. 41-66.

UIC, proximity to Canada Manpower Centre is an important locational factor. The model is used to provide a quantitative basis for comparing accessibility costs incurred at actual service locations with optimal service locations. Although the model possesses some normative properties, the main interest in this study is to use it as a tool for evaluating the spatial efficiency of a single federal department, Unemployment Insurance Commission.

Chapter III

METHODOLOGY

Any explanation must adhere to the rules set out within a certain methodology. Since this study attempts to describe the locational properties of services rather than to explain fully why services locate where they do, it is neither essential nor possible to follow the complete range of logical processes that lead to the development of theory. On the other hand, it is necessary to interpret the data within the logical structure of an established methodology.

Since public services are usually referred to in the literature as systems, descriptive clarity and potential explanatory power will be gained by discussing the location of federal services in systems terminology and perspective. A scientific account of a system must include:

1. An identification of . . . the elements of the system.
2. A specification of . . . the characteristics of the elements relative to which descriptions of the states of the system are to be provided.
3. A specification of the set of laws in conformity with which states of the system succeed or precede each other, or with which elements of the system interact as regards the characteristics specified in 2.[1]

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[1]Richard S. Rudner, Philosophy of Social Science. Englewood Cliffs: Prentice-Hall Ince., 1966, p. 89.

Besides discovering the relative importance of locational criteria for federal services, however, a major problem in a systems approach is to define and determine the locations which would simultaneously optimize these criteria. Ideally, the optimal location would be based on sound normative principles which could be quantified and structured for solution by computer. The optimal solution could be used to devise an index for describing the state of the locational system at a given point in time. At the same time, a complete systems explanation would require knowledge of the dynamics of federal service location requirements and a set of laws for predicting future states of the locational system.

Within the stated purpose of this study, it is possible merely to identify a limited number of the criteria which ought to be considered in the location system of urban-based, consumer-oriented federal services, and to evaluate the relative importance of general location requirements as manifest in the actual spatial distribution of services.

IDENTIFICATION OF LOCATIONAL CRITERIA FOR FEDERAL SERVICES

The choice of a location for a federal service is intended to meet objectives, whether explicitly or implicitly. Although the objectives might be ill-defined and poorly measured, some attempt is usually made to realize the location requirements of services.

One objective in the location of federal services is to rent or to construct facilities on sites which permit relatively easy contact

between government employees and clients drawn from the public and private sectors. In the first stage of the analysis, it is therefore necessary to identify: 1) the particular services offered by each department, and 2) the relative importance which each service attaches to its location requirements.

In this study, data on locational criteria and planning guidelines were derived from a questionnaire mailed to twenty-five federal departments in Edmonton. Departments, agencies and corporations which are not consumer-oriented or cannot properly be called a "public service" were not surveyed.

The location of a resource-oriented service is influenced mainly by the specific location of non-human resources.[2] A consumer-oriented service is directed towards members of the public and its location is primarily determined by the distribution of clients. Since this study is concerned with urban-based services, resource-oriented services are omitted.

The data are further limited to a selection of consumer-oriented services. Several crown corporations, for example Air Canada, are eliminated if they are more closely aligned with private enterprise than with the public sector. That is, government functions which are motivated by profit are omitted. Two other corporations, the Canadian Broadcasting Corporation and Central Mortgage and Housing Corporation are included in the survey.

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[2]Bryan H. Massam, The Spatial Structure of Administrative Systems. Commission on College Geography, Resource Paper No. 12, Washington, D.C.: Association of American Geographers, 1972.

The selection was further restricted to activities directed towards face-to-face contact with the public. It is believed that by restricting the study to a homogeneous set of services, several conceptual and measurement problems referred to in Chapter I can be eliminated. By standardizing the unit of analysis, it is easier to make inter-departmental comparisons, and the possibility of reaching valid conclusions should be increased.

The questionnaire respondents were requested to rank a fairly comprehensive set of spatial location requirements which are relevant to consumer-oriented services offered by their departments. They were also requested to state why these requirements are important in the provision of services to clients, and to describe location principles used by their department. The questionnaire was administered in July and August, 1975, following revisions to a pilot survey conducted in June, 1975.

The data will be tabulated and cross-tabulated to show overall preference for specific locations and locational criteria as expressed by decision-makers. The data will also be analysed by sorting services into a two-fold classification based on the type of service provided to the client at the time of his visit to an office; and the level of face-to-face contact taking place at a service location. Each classification serves as an organizing principle around which the spatial distribution of federal services is analysed and described.

By itself, the questionnaire indicates only what location

requirements should be satisfied in the choice of a service location. The results reveal nothing about the actual spatial organization of services. To examine this problem it is necessary to employ a body of techniques which either directly or indirectly reveal the spatial associations formed among federal services and other urban activities. Since the primary purpose of the study is to indicate the existence of relationships rather than to provide a measurement of the absolute strength of those relationships, indirect measures of spatial association are sufficient for the objectives specified for this thesis. The nearest neighbour technique and centrographic measures of dispersion have been selected as useful techniques for describing the spatial characteristics of federal services.

DESCRIPTIVE MEASURES OF THE SYSTEM OF SERVICE LOCATIONS

Given that the activities of the federal government can be viewed as a system of which consumer-oriented services constitute one subsystem, several characteristics can be attributed to each. Since systems, especially social systems, rarely occur spontaneously or randomly in time,[3] federal services form a system which has evolved, developing more quickly in some periods than others, and spreading

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[3]David Harvey, "Models of the Evolution of Spatial Patterns in Human Geography," in Richard J. Chorley and Peter Haggett (eds.), Models in Geography. London: Methuen & Co. Ltd., 1967, p. 549.

with a specific directional bias during its development. The areal associations formed during the course of its development are poorly understood, however. It is assumed here that the identification of these spatial associations will provide some insight into the functional relationships which have helped to create the present pattern of service locations.

Two main locational characteristics of the federal system of services are examined: dispersion and spacing. Dispersion has been defined as "the degree of spread of a set of points relative to some delimited areas."[4] Spacing refers to "...the locational arrangement of objects with respect to one another..."[5] Location patterns are treated by describing shifts in the centre of gravity of services, and by relating directional properties of spatial change to two reference points, the peak land value intersection at Jasper Avenue and 101 Street provides a useful reference point for describing the changing distribution of services within the central business district. The Edmonton Central Post Office was until circa 1960, the main building for housing federal services in the central business district.

In geographical point pattern analysis, a body of techniques is available with which to describe the spatial distribution and the

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[4]Kevin Cox, Man, Location and Behavior: An Introduction to Human Geography. New York: John Wiley & Sons, Inc., 1972, p. 193.

[5]Ibid., p. 194.

metamorphosis of a point pattern in a region. Describing the tendency of points (federal services) to concentrate or disperse within a region (central area), and observing any predilection for services to associate areally with other activities found in the same region, establishes some observable evidence for indicating potential lines of investigation. Another important function of these techniques, as used in this study, is to establish a basis for comparing the apparent reasons for service location with the locational criteria that decision makers feel ought to be satisfied. Two techniques are described in this Chapter, point pattern analysis, and centrographic measures.[6]

In its general form, point pattern analysis compares a set of observed points to a set of theoretical points derived from either the Poisson or negative binomial distributions. The former generates an expected point set that is randomly distributed, whereas the latter is thought to generate a clustered set.[7]

Nearest Neighbour Analysis

Distance measures such as the nearest neighbour statistic of

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[6]Some authors, for example, King, treat nearest neighbour and centrographic measures together as point pattern analysis. Others, for example, Greer-Wootten, distinguish between the two. Theoretically, a distinction does exist, and is adhered to throughout this thesis. See L.J. King, Statistical Analysis in Geography. Englewood Cliffs: Prentice-Hall Inc., 1969; and Bryn Greer-Wootten, Statistical Applications in Geography. Commission on College Geography, Technical Paper No. 9, Washington, D.C.: Assocation of American Geographers, 1972.

[7]Greer-Wootten, 1972, pp. 48-49.

ecology describe the distribution of points relative to one another and the distance separating nearest points (neighbours). The results are influenced by the size of the sample and the area selected for analysis.[8] Getis also cautions that "...a repeated pattern of two or more closely spaced points occurring far from one another would yield a low value of R (indicating aggregation) even when the pattern may appear dispersed."[9]

The nearest neighbour statistic (R) is given by the formula[10]

$$R = \frac{R_0}{R_E}$$

The expression R_E is the expected mean distance of a point from its nearest neighbour in a random distribution. That is,

$$R_E = \frac{1}{2\sqrt{\frac{N}{A}}}$$

where $\frac{N}{A}$ is the number of points (N) divided by the area (A) under consideration.

The observed mean distance (R_0) is calculated by summing the distance between each point and its nearest neighbour and dividing by the total number of measured pairs.

The R statistic is applied to the distribution of federal offices in the central area of Edmonton at five year intervals beginning in

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[8] Arthur Getis, Temporal Land Use Pattern Analysis with the Use of Nearest Neighbor and Quadrat Methods. Ann Arbor: Michigan University Community of Mathematical Geographers, Discussion Paper No. 1, 1963, pp. 4-5.

[9] Ibid., pp. 5-6.

[10] R. Hammond and P. McCullagh, Quantitative Techniques in Geography. Oxford: Clarendon Press, 1974, pp. 238-240.

1915 and ending in 1975. Although the study focuses more on federal services than on offices, it was not possible to identify services which existed in the past from available data. Instead, the number of branches within each department was used as a surrogate for the number of services provided. Generally, the departments which offer the most services are those with the largest number of branches. A comparison of the distribution of actual consumer-oriented services in Edmonton in 1975 with the location of department branches indicated that there is a correspondence between the size of departments and the number of services provided.

Centrographic Techniques

Centrographic techniques are useful aids in describing geographic distributions. Though similar in form to conventional statistics, centrographic measures are based on the assumption that the areal distribution under consideration is bivariate normal. The measures which are most appropriate for describing the spatial properties of the federal service system are: the mean centre, standard distance, standard radius, coefficient of circularity and distance of displacement. These measures are summarized visually by plotting the standard deviational ellipse for the distribution of federal services and offices at given time periods. A single program, CENTRO, calculates and plots these measures.[12]

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[12] John Hultquist, John Holmes, and Lawrence Brown, CENTRO: A Program for Centrographic Measures. Department of Geography, Ohio State Discussion Paper No. 21, n.d.

Mean Centre. The mean centre is the exact equivalent of the arithmetic mean of conventional statistics. As with the latter, extreme locations of members of the population, or points in the distribution, have a strong influence on the magnitude of the computed value. Asymmetric, irregular and multi-nodal area distributions make it difficult to interpret the mean centre and other centrographic measures.

The mean centre, or centre of gravity, for areal data can be defined as the point at which a distribution located on a weightless plane is balanced. Most centre of gravity measures are based on the Pythagorean Theorem, calculated as the point in the Cartesian co-ordinate system which represents the independent arithmetic means of the x-values and the y-values located in the plane. The x- and y-values are weighted by the population of each cell in the Cartesian grid.

Mathematically, the mean centre is defined as[13]

$$E(X) = \bar{X} = \frac{\sum_{i=1}^{n} wixi}{\sum_{i=1}^{n} wi}$$

and

$$E(Y) = \bar{Y} = \frac{\sum_{i=1}^{n} wiyi}{\sum_{i=1}^{n} wi}$$

where the point of intersection of $\bar{X}$ and $\bar{Y}$ are calculated as the average

[13] This equation and all subsequent formulae for calculating centrographic measures are taken from Hultquist et al., n.d.

position of the weighted points (wi) in the co-ordinate system.

Timms has reviewed four main properties of the mean centre for areal distributions:

1. It does not have to be located within the area under consideration.
2. It does not necessarily indicate any characteristic of the region in which it is located.
3. Extreme locations affect its position.
4. It is sensitive to minor changes in the distribution under consideration.[14]

The last property makes the centre of gravity useful for studying general trends in the pattern of office location over time.

Standard Distance. The standard distance is a measure of the dispersion of points along a line which passes through the centre of gravity; thus, it is similar to the variance calculated for a univariate distribution. If the bivariate distribution under consideration is circular, the standard distance will not vary about two lines, one passing through the same point but parallel to the original Y-axis.

For the original X-axis, the standard distance is for (S^2X) calculated by the formula

$$S^2X = \frac{\sum_{i=1}^{n} (w_i x_i - w_i \bar{x})^2}{\sum_{i=1}^{n} w_i}$$

[14] D. Timms, "Quantitative Techniques in Urban Social Geography," in R.J. Chorley and P. Haqqett (eds.), Frontiers in Geographical Teaching, London: Methuen & Co. Ltd., 1965, p. 245.

and S^2Y is computed in a similar manner.

Standard Radius. The standard radius is analogous to the standard deviation in conventional statistics. It describes the dispersion of a population over its area. In most cases deviations about the mean centre are measured, although some other functionally related node can be used as a reference point. The latter are difficult to interpret, however.[15]

The standard radius (Sr) is computed by the formula

$$S_r = \sqrt{\frac{\left[\sum_{i=1}^{n} w_i (x_i - \bar{x})^2 + \sum_{i=1}^{n} w_i (y_i - \bar{y})^2\right]}{\sum_{i=1}^{n} w_i}}$$

which minimizes, in this case, the squared deviations taken from the mean centre.

Coefficient of Circularity. For a non-circular distribution, the central reference axes are rotated until the correlation between the values produced by projecting the distribution separately on the X- and Y-axes is reduced to zero. The rotation produces a major axis about which the standard distance is at a minimum, and a minor axis which is orthogonal to the mid-point of the major axis. The value of the ratio between the

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[15] D.B. Lee, Analysis and Description of Residential Segregation. Ithaca: Cornell University for Housing and Environmental Studies, Regional Science Research Institute, Monography Series Number 2, 1967, p. 49.

two axes provides a measure of the degree to which the distribution is non-circular. The ratio takes on values from 1.0 (circle) to 0 (straight line) and the two dimensional figure described by the coefficient of circularity is called the standard ellipse.

When constructed about the mean centre of the distribution, the standard ellipse provides an excellent graphic summary of average location, concentration, and orientation of the point set. The area of the standard ellipse and the number of points contained therein can be given a relative interpretation by comparison with other data. When the ellipse is small relative to the study area, the distribution is clustered. The converse holds true for a larger ellipse.[16] A sequential series of ellipses for the distribution of federal offices and services indicates the relative changes that have occurred in the locational system.

The proportion of points enclosed within the ellipse establishes an index of concentration. The R value of the nearest neighbour statistic accompanied by the concentration index, provide a useful technique for describing some states of the locational system.

Distance of Displacement. The distance of displacement, the Euclidean distance separating the mean centre from a reference point, is the final centrographic measure used in this study. The linear distance from the

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[16] Robert S. Yuill, "The Standard Deviational Ellipse; An Updated Tool for Spatial Description," Geografiska Annaler, Vol. 53, No. 1, 1971, p. 34.

mean centre to the Edmonton Central Post Office provides a simple measure of the rate of movement in the centres of gravity of offices and services during the study period.

Centrographic measures and point pattern analysis are useful techniques for describing a number of spatial characteristics of federal offices and services through time. Hopefully, the application of the two techniques will indicate some properties of the possible states of the locational system and will suggest predominant areal associations formed between government functions and other central business district activities.

THE LOCATION-ALLOCATION MODEL

To evaluate the accessibility inherent in federal service locations within Edmonton's central area, a location-allocation model is used to find the locations which minimize the total aggregate linear distance for clients going to the two UIC offices and returning to their place of residence. Total aggregate distance is computed in a similar manner for the actual locations of the two UIC offices and the optimal costs are measured against actual costs to determine the level of efficiency and equity inherent in the actual facility system.

There are two main reasons why Unemployment Insurance Commission was selected as a case study. First, it is a consumer-oriented service with an identifiable clientele. The location of its clients can be mapped with comparative ease. Second, the common economic circumstances

of its clients facilitate the definition and application of a spatial principle of equity.

To map the location of UIC clients, a recent map of Edmonton is overlaid with a square net grid containing 73 columns and 74 rows. A cell width of 750 feet (228.6 metres) was selected as a suitable scale, since Gould et al. have shown that the accuracy of their location-allocation model increases with decreasing cell size.[17]

Unfortunately, the choice of cell size poses a dilemma. A small cell size ensures that precise results are obtained at the intra-urban scale, but at the expense of clients who reside outside the city of Edmonton. If the size of the grid were increased to cover the entire area served by the two UIC offices in Edmonton, the accuracy of the results on the intra-urban level would be lowered. Since the study is concerned with the location of federal services on the intra-urban level, it was decided to opt for accuracy instead of complete coverage. Thus, the model determines the optimal locations for two facilities based on the distribution of UIC clients who reside within Edmonton's city limits. Unemployed persons living in Edmonton represent 53.8 per cent of all clients served by the two facilities; but, it is likely that the Edmonton clients represent a much higher proportion of all clients who actually visit one of the two facilities.

Realistically, it would have been desirable to determine the

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[17] Peter Gould, Stig Nordbeck and Bengt Rystedt, "Data Sensitivity and Scale Experiments in Locating Multiple Facilities," in G. Tornquist, P. Gould, S. Nordbeck, and R. Rystedt (eds.), Multiple Location Analysis. Lund Studies in Geography, Lund: Gleerup, 1971, pp. 69-84.

mode of transport used by out-of-town clients who travel to one of the UIC facilities, and to devise a weighting system based on trip-costs to the Edmonton destination point. For example, for clients who arrive at the Greyhound Bus Depot, the cell containing the terminal could have been weighted by an amount of equal to the transportation cost incurred by the client. Unfortunately, time did not permit the collection of these data. Hence, the model produces optimal locations for unemployed persons residing in Edmonton. In this sense, the model is defective as a planning device. Conversely, the results can be used to discuss the spatial characteristics of service locations within the context of Edmonton itself.

The objective function for the UIC problem is derived for a weighted point set. Each cell is weighted in accordance with the number of clients which occupies it. The weighted cells provide a measure of spatial equity in the system.

The actual locations of UIC offices are measured against an accessibility index. The index is based on the point of maximum accessibility defined as the optimal location costs computed by the location-allocation program and the distance costs incurred by clients who travel to the actual locations. The expression $\frac{\text{optimal costs}}{\text{actual costs}} \times 100$ establishes a simple measure of the accessibility inherent in the actual location of UIC offices. Map analysis of bus service catchment areas is used to determine the public transit opportunities inherent in the optimal locations compared with bus service to the actual locations.

In conclusion, the literature on public services makes few direct references to federal services. Yet, the research which has been undertaken to date indicates that it is necessary to isolate the main components of public services when the objective is to identify and measure the relevant locational criteria and allocative mechanisms for facility systems. Furthermore, the literature suggests that more intensive analysis of public service location requirements will provide insight into the efficacy of existing location-allocation models and the remifications of particular planning decisions.

SOURCES OF INFORMATION AND DATA PROBLEMS

Three basic types of data were used in the analysis of federal services: information derived from a questionnaire; addresses of federal services from 1909 to 1975; and addresses of the clients of Unemployment Insurance Commission. Problems were encountered in the collection and applicability of each type of data.

The Questionnaire

The questionnaire requested a ranking of location requirements and an explanation of the reasons for selecting certain location requirements over others. Respondents did not, or were unable to give a full account of these choices. There are two possible explanations. First, respondents might have been more co-operative had the questionnaire

been administered in person. Second, and more likely, respondents were only vaguely aware of the implications of locational decision-making. The lack of service location planning guidelines in most of the departments surveyed tends to support the seond reason.

The Location of Federal Services

The number and size of departments located in Edmonton in 1975 as compared with 1909 clearly reveals the growth of federal services during that period. Since 1909, new departments and agencies have been created, some have gone out of existence, while others have been incorporated into new or existing departments. Without time-consuming and complicated research it is impossible to sort out the myriad services that have been provided by the federal government in the past. The only recourse is to structure the analysis around available data which, in the present case, are addresses of federal offices taken from Edmonton and Vicinity Telephone Directories and from Henderson's Directories. Since the listings provide a breakdown of departments into their main branches and sections, these serve as a surrogate for the number of services provided by each department. It was not possible to determine the type of service offered by departments in the past, and this is a shortcoming of the analysis.

Delimiting the Central Business District

A major problem in the analysis of federal service locations was

to determine appropriate boundaries for the area under investigation. The study focuses on the central area, that region of the city containing the greatest variety of functions and wherein the most intensive urban activity takes place. Usually, distinctions are drawn between the central business district, the area of maximum intensity, and the frame, a wide belt of lower intensity land use which merges with purely residential land use at its periphery. The central business district (CBD) is characterized by multi-storied buildings, high retail sales density per unit ground area, a heavy concentration of public transit service, and high volumes of traffic.[18] The frame contains lower intensity commercial land uses, fewer multi-storied buildings, and proportionately more of the vacant sites and parking space found within the central area.[19] Typically, the frame contains lower volumes of pedestrian traffic and poorer transit service relative to that available in the central business district.

It was impossible, barring painstaking research, to reconstruct accurately the central area of Edmonton as it existed before 1960. An objective delimitation of the central business district and the entire central area of Edmonton was performed by Bannon for 1966, and Edmonton planners, using a less objective technique, delimited the CBD for 1952 (Figure 4). The area shown for 1952 in Figure 4 gives an exaggerated estimate of the actual area of the CBD. Measurements taken by the

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[18] M. Yeates and B. Garner, The North American City. New York: Harper & Row, 1971, pp. 320-322.

[19] Ibid., pp. 321-323.

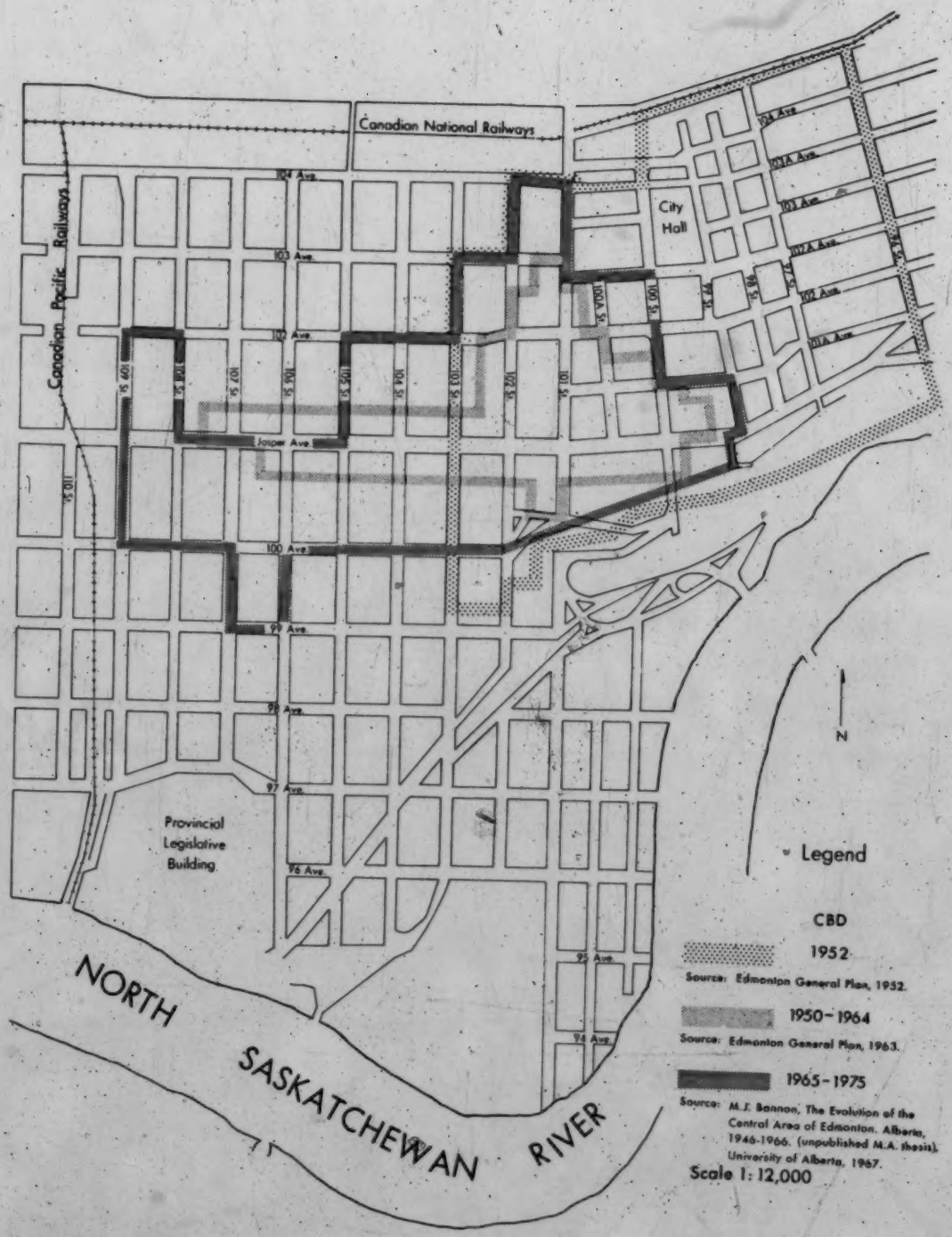

Fig. 4: Edmonton's central area, 1950-1975.

planning department in 1963 are perhaps more representative of the CBD as it existed from 1950 to 1966 (Figure 4); Bannon notes that CBD functions moved steadily westward along Jasper Avenue after 1946, and that little development took place in the northeast before 1960.[20]

Prior to 1946, the CBD changed slightly, although it had shifted from east of 100 Street to the area adjacent to 101 Street.[21] It is doubtful that the limits of the CBD before 1946 were very different from the area shown in Figure 5, even as early as 1915. MacGregor's chronicle, for example, indicates that 97 Street and 101 Street were flourishing business arterials in 1912, with three key structures, the McLeod Building (100 Street and 101 A Avenue), the Tegler Building (10189 - 101 Street), and the Macdonald Hotel under construction.[22] Each of these structures was within the CBD as defined for 1946. Finally, MacGregor writes that as late as 1920 "downtown Edmonton was a crossword puzzle half filled in . . . ."[23] On the basis of this evidence, it appears that the limits of the CBD in 1946 were established before 1920. The intervening period, 1920-1945, was primarily one of intensification within the 1946 boundary, and not of progressive outward expansion.

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[20] Michael J. Bannon, The Evolution of the Central Area of Edmonton, Alberta, 1946-1966. (unpublished M.A. Thesis), Department of Geography, University of Alberta, 1967.

[21] Ibid.

[22] J.G. MacGregor, Edmonton: A History. Edmonton: M.G. Hurtig Publishers, 1967, p. 190.

[23] Ibid., p. 226.

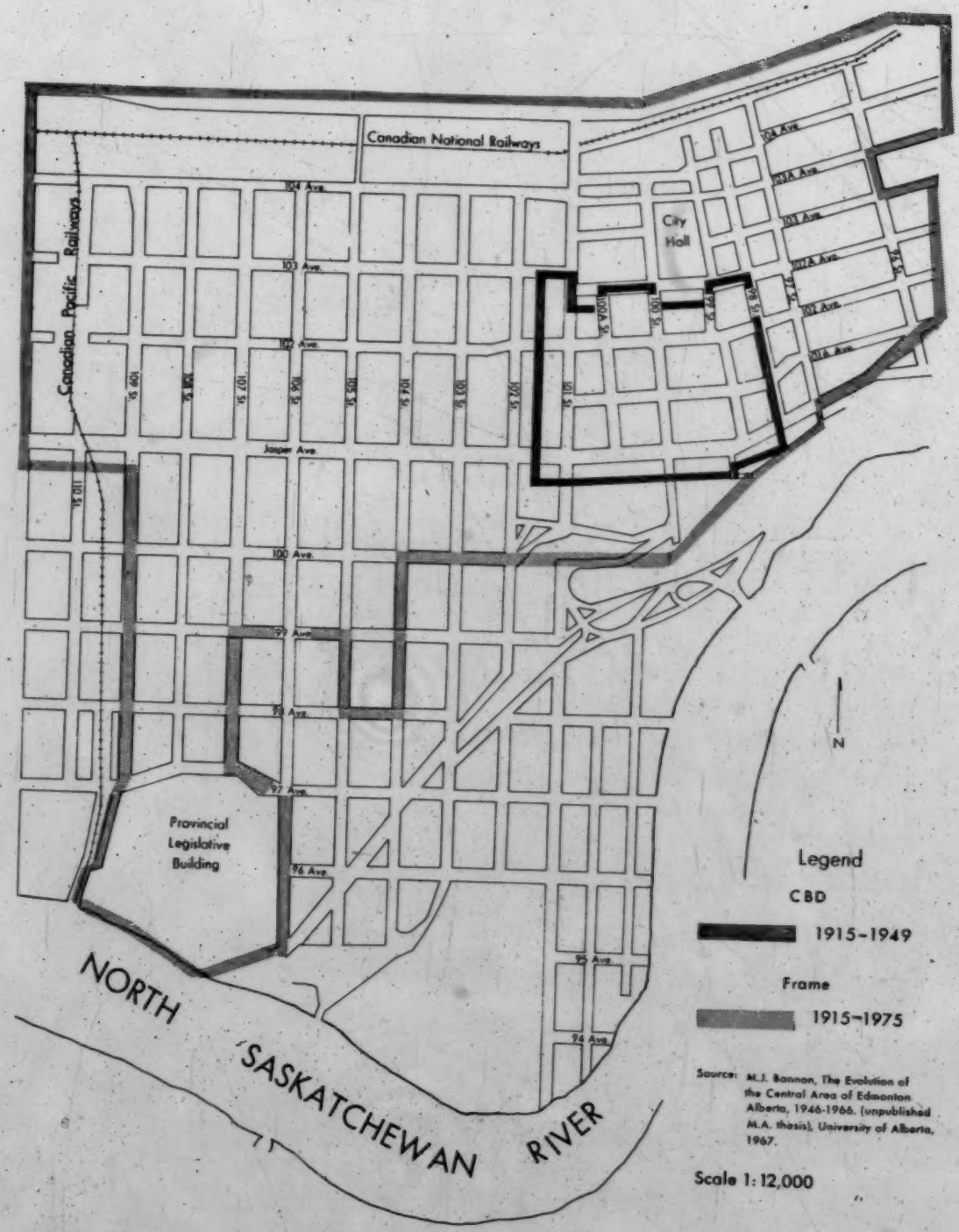

Fig. 5: Edmonton's central area, 1915-1949.

The paucity of reliable information which could be used to delimit the outer boundary of the frame necessitated recourse to the 1966 measurement taken by Bannon (Figure 5). Portions of Bannon's frame within which federal services have not located in the past were eliminated from the nearest neighbour and centrographic calculations. Two ribbon developments, one along Jasper Avenue west of 110 Street, the other north of 105 Avenue along 101 Street were eliminated. Also, a small segment of the frame between 95 and 96 Streets was not included.

Unemployment Insurance Commission Data

Location-allocation models for federal services should contain dynamic elements which take into account the changing distribution of clients, future costs, the semi-permanent nature of facilities, and the behaviour of clients who use the services. The optimal locations identified in this study are based on a static system, since cost variables and length of occupation in UIC offices could not be determined. Perhaps more importantly, it was not possible to measure long-term locational shifts in the population served by UIC in Edmonton. Computer-stored data on UIC clients are current; there are no readily available records on clients from previous years. Furthermore, UIC data on the economic characteristics of clients were not appropriate for a definition of equity which explicitly recognizes differences in income levels among individuals.

The very nature of Unemployment Insurance Commission ensures that

some measure of equity can be achieved without the use of income data. Since the objective function of the model discriminates in favour of cells which are found within hard-core unemployment areas (Chapter VI), a weighting system based solely on the number of unemployed persons residing in a cell ensures that the locations derived by the location-allocation model will be pulled towards the more heavily weighted cells.

A fifty per cent systematic sample of UIC clients addresses was taken to make certain the hard-core unemployment areas were identified. Although time did not permit all addresses to be mapped, the fifty per cent sample was satisfactory. Concentrations of UIC clients in Edmonton correspond with the location of major low income areas identified from census data.[24] Also, the sample size revealed that smaller, but important concentrations of UIC clients exist in some high income residential districts, for example, adjacent to the University of Alberta. Finally, few extremely located cells containing a single UIC client resulted from the sampling procedure: weighted cells tend to form contiguous areas of greater or lesser unemployment. Although there is no theoretical justification for selecting a fifty per cent sample size in this particular case, the resulting distribution does appear to be empirically valid.

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[24] Census of Canada, Income Distribution by Census Tract: Edmonton, 1971.

Chapter IV

MANAGEMENT ATTITUDES TO THE LOCATIONAL CRITERIA OF FACE-TO-FACE CONTACT SERVICES

The traditional locus of government offices is the central area. In Edmonton, approximately 80 per cent of all federal consumer-oriented services are presently found there. Most of the others are located along one of two commercial ribbons, Whyte Avenue and Kingsway. The reasons for the pre-eminence of the central area as the focus of government activities are largely unknown, although general notions have been posited. Manners, for example, observes that certain types of office activities are functionally oriented towards the city centre where, presumably, they can readily obtain inputs of advice, data, and expertise from a variety of professions and other services.[1] On the other hand, little effort has been expended towards isolating the location requirements of the specific activities engaged in by government.

The purpose of this Chapter is to identify the location requirements of face-to-face contact services, and to describe the pre-eminence of the CBD by reference to the locational attitudes of federal decision-makers. A general summary of attitudes to the location

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[1] Gerald Manners, "The Office in Metropolis: An Opportunity for Shaping Metropolitan America," Economic Geography, Vol. 50, No. 2, 1974, p. 93.

requirements of federal services is presented first. This is followed by a more detailed analysis of location attitudes according to both the level of face-to-face contact taking place at a service location and the type of service.

OVERVIEW OF ATTITUDES TO LOCATIONAL CRITERIA

Gross tabulations of decision-makers' attitudes to the location requirements of their services fall broadly into two sets of information. The first concerns identification of the locational criteria, and the second relates to the description of the functional relationships which attract federal services to the central area or to other parts of the city.

It is intuitively obvious that most consumer-oriented services exhibit a preference for the central area. Yet, it is not an axiom, as TABLE I reveals, that all decision-makers, if given a choice, would choose the central area. In fact, respondents listed 28 services (38.3 per cent) which they felt should be located outside the city centre. Although the majority of services (45 services) would rather be in and near the CBD, this is somewhat less than the actual number presently located in the central area (60 services). This discrepancy immediately suggests that spatial efficiency for some services might not be realized in the central area. On the other hand, only four services would actually choose a location outside the fully developed sections of the city (TABLE I).

TABLE I

GENERAL AREA PREFERRED BY FACE-TO-FACE CONTACT SERVICES

Area	Number of Services	Per Cent of Total
Centre of Edmonton	45	61.7
Inner City	19	26.0
Attached Suburbs	5	6.8
Detached Suburbs	0	0.0
Urban Fringe	4	5.5
Rural	0	0.0
	73	100.0

Consumer-oriented services display a marked favouritism towards the city centre and the inner city. The reasons for this preference can be related to the city's transportation network, and the nature and location of clients and other activities integral to the operation of consumer-oriented services.

RELATIONSHIPS WITH OTHER ACTIVITIES

The services surveyed indicate a strong affiliation with commercial land uses. In fact, respondents stated that 73.6 per cent of the services should be in the central retailing district, and another 20.8 per cent in some other commercial district. The respondents did not, or were unable to present strong arguments as to why their services require commercial sites. Invariably, the reasons they gave were brief and not informative. Trite responses, for example, "transportation"

and "near bus routes", were very common. The failure to state precisely why commercial locations are needed suggests that related activities and location requirements areally associated with the central area are the principal factors in the selection process. In the central area, respondents feel, they are near the other government services and private firms with which they do business, and within easy reach of public transit for employees and clients.

One important factor is proximity to other government services. Slightly more than two thirds of the services require close contact either with other government departments or with other activities in the same department (TABLE II). Nineteen services listed in TABLE II depend on the availability of essential urban services. Respondents identified several essential urban services. The most important of these were recorded as the availability of metered parking, adequate road networks and public transit. To a lesser extent, proximity to hotels, banks, and the Law Courts Building were included in the list.

TABLE II

ESSENTIAL ACTIVITY ASSOCIATION FOR SERVICES

Type of Activity	Number of Services	Per Cent of Total Response
Near activities of other departments	17	26.5
Near activities of the same department	26	40.6
Near essential urban services	19	29.6
Near provincial government services	1	1.5
Other	1	1.5

On the basis of the evidence in TABLE II a minority of services has close functional ties with non-governmental services located in the central business district. The implication is that a policy of decentralization from the central area, if carried out simultaneously for those federal services which are functionally related but do not need other services found only in the central area, would not seriously impair the operational efficiency of services. Of course, this is contingent upon the fulfillment of other location requirements elsewhere in the city.

By inference, the data in TABLE II further suggest that inertia is a characteristic of the spatial distribution of services. Individual services require close contact with other federal services found nearby. Since a single service cannot move from the central area without relinquishing its necessary spatial ties to interrelated services, none of the services will move. Whereas activity associations are an important reason for the location of face-to-face contact services, decision-makers feel that accessibility for their employees and clients represents a greater consideration in the choice of a location.

TRANSPORTATION AND ACCESSIBILITY AS LOCATIONAL CRITERIA

For a majority of consumer-oriented services, the most important transportation criterion is the availability of adequate public transit for their clients. Since most of Edmonton's bus routes converge on the central business district, this area is considered by decision-makers

to possess the greatest transportation amenities. TABLE III clearly shows the importance of public transit for face-to-face contact services. Over 70 per cent of all consumer-oriented services require proximity to public transit. The remaining services (27.4 per cent) depend on adequate parking space.

Unfortunately it is not known in all cases whether the importance of public transit results from proportionately greater numbers of clients travelling by bus, or whether decision-makers are simply more sensitive to the needs of customers who do not travel to an office by private vehicle. For the services offered by Unemployment Insurance Commission and Health and Welfare, most clients do travel by bus and their needs are overtly recognized by decision-makers. For most services, however, the modes of travel of the clientele have not been precisely determined. It will not be possible to determine relevant locational criteria for services until the number and characteristics of clients travelling to the facility have been identified.

The importance of public transit is directly related to a concern for the client. Slightly more than two thirds of the services must, in the minds of decision-makers, be accessible to their clientele, whereas only 27.1 per cent are primarily interested in the trip to work and field trips by employees (TABLE IV). In summary, TABLE IV indicates that most respondents emphasize accessibility for their clients, although nearly one third are overtly concerned with the movement of employees. The reasons for these differences are discussed in greater detail in the next section.

TABLE III

ESSENTIAL TRANSPORTATION CRITERION FOR SERVICES

Transportation Requirement	Numbers of Services	Per Cent of Total
Public transit	53	72.6
Parking (crown and employee vehicles)	11	15.1
Parking (clients)	9	12.3
Rail	0	0.0
Airport	0	0.0
Other	0	0.0

TABLE IV

ACCESSIBILITY CRITERION FOR SERVICES

Accessibility	Number of Services	Per Cent of Total Response
For employees travelling to the office or to visit clients	19	27.1
For clients travelling to the office	47	67.2
To points of delivery or pick-up	1	1.4
To interrelated urban activities	2	2.9
Other	1	1.4

In general, the data indicate that accessibility for clients and employees, and proximity to interrelated government functions, are the spatial requisites of location. Over 50 per cent of the services, in fact, consider accessibility their single-most important criterion (TABLE V). On the other hand, twenty three services (31.5 percent) purportedly require a combination of location requirements which they have identified as being available only in specific areas of the city (TABLE V).

TABLE V

ESSENTIAL GENERAL LOCATIONAL CRITERION FOR SERVICES

Location Requirement	Number of Services	Per Cent of Total
A specific area of the city	23	31.5
Proximity to complementary land uses	1	1.3
Proximity to complementary activities	2	2.8
Near particular modes of transport and transportation facilities	10	13.7
Accessibility	37	50.7

The latter group of services, according to respondents, are strictly tied to the central business district and adjacent areas because of the advantages inherent in a commercial location. All twenty-three services favour a commercial location over any other.

This preference appears to be related to the availability of bus connections and the location of interrelated activities in the central retailing district. The data tend to support this observation. Over 91 per cent of the twenty-three services indicated that public transit is their most important transportation requirement, and fully 95.6 per cent are predominantly concerned with accessibility for their clients.

LOCATIONAL CRITERIA ACCORDING TO THE LEVEL OF FACE-TO-FACE CONTACT

By examining individual services, the analysis is reduced to a study of the unique. A classification of services isolates service characteristics which members do or do not possess. Classifications thus permit generalizations to emerge and an identification of service attributes. The generalizations can be used to test the correspondence between an actual location pattern of services and the idealized pattern as expressed by decision-makers. The attributes of services are useful in a real planning situation, because they function as locational criteria or elements which can be used to assess the impact of alternative locational strategies on spatial efficiency.

Any classification must contain at least two features: mutually exclusive categories; and enough categories for each member to fit into a single class. The first classification scheme presented, the level of personal contact occurring at a service location, conforms to the logical structure of a classification system.

The amount of face-to-face contact taking place at a service location ranges from 5 per cent to 100 per cent for the services surveyed. According to the classification scheme presented in TABLE VI, face-to-face contact for most services occurs outside the office. In other cases, low contact services carry out much of their business by telephone or correspondence.

TABLE VI

PER CENT OF TOTAL PUBLIC CONTACT OCCURRING AT A SERVICE LOCATION

Personal contact at an office (%)	Number of Services	Per Cent of Total
≤50	40	54.8
>50 ≤75	9	12.3
>75	24	32.9

Less than one half of the services (45.2 per cent) meet most of their clients personally at a service location. High face-to-face contact services require proximity to bus routes and favour the CBD, whereas the low contact level services emphasize parking and locations outside the CBD.

In TABLE VII the positive relationship between the level of personal contact and preference for the city centre is clearly revealed.

TABLE VII

AREA OF CITY PREFERRED: BY LEVEL OF FACE-TO-FACE CONTACT OCCURRING AT A SERVICE LOCATION

Personal Contact at an office (%)	Area of City (#:%) Inner City	Centre of Edmonton	Attached Suburb	Urban Fringe	Total #:%
≤50	14:35.0	19:47.5	4:10.0	3:7.5	40:100
>50 ≤75	1:11.1	7:77.6	1:11.1	--	9:99.8
>75	3:14.3	18:85.7	--	--	21:100

Preference for the city centre increases from 47.5 per cent of the lowest contact group to 85.7 per cent of the uppermost group. Conversely, the group ≤ 50 expresses a greater preference for locations outside the city centre. On average, as the level of face-to-face contact for federal consumer-oriented services increases, greater emphasis is placed on a city centre office. To understand why this generalization appears to be valid it is necessary to examine the activity characteristics, transportation requirements and accessibility parameters of the three categories of personal contact services.

Services in the lowest contact level group are more dependent upon proximity to other government services, including services in the same department, than are the two upper groups (TABLE VIII). Specifically, a total of 29 services (columns 1 and 2) in the group ≤ 50 is closely associated with government units, whereas only eight services (40.0 per cent) in the >75 group are so related. For services where the level of contact at an office is between 50 and 75 per cent, proximity to

government functions is nearly as high a priority as for the low contact group (TABLE VIII). On the other hand, eleven services (55.0 per cent) in the >75 group need one or several of the essential urban services mentioned earlier, rather than proximity to government services.

TABLE VIII

ESSENTIAL ACTIVITY ASSOCIATION: BY LEVEL OF FACE-TO-FACE CONTACT OCCURRING AT AN OFFICE

Personal Contact at an office (%)	Activity Requirements (#:%) near services of the same department	near other federal departments	near essential urban services	other	Total #:%
≤50	20:54.0	9:24.3	7:18.9	1:2.8	37:100
>50 ≤75	2:28.7	3:42.8	1:14.4	1:14.1	7:100
>75	4:20.1	4:20.0	11:55.0	1:5.0	20:100

All three groups need locations which are accessible for their clients or employees. As TABLE IX shows, accessibility for clients increases in importance as the level of face-to-face contact increases (60.0 per cent to 70.8 per cent), and declines for employees' accessibility (35.0 per cent to 16.7 per cent).

Transportation requirements are fairly similar for the three groups. TABLE X indicates that public transit is the most important single factor governing the choice of a location. Services which require parking space above any other factor are in a minority for all groups.

TABLE IX

ACCESSIBILITY CRITERION PREFERRED: BY LEVEL OF FACE-TO-FACE CONTACT OCCURRING AT AN OFFICE

Personal Contact at an office (%)	Accessibility (#:%) for clients	for employees	to points of delivery or pick-up	to complementary land use & activities	Total #:%
≤50	24:60.0	14:35.0	1:2.5	1:2.5	40:100
>50 ≤75	6:66.7	3:33.3	--	--	9:100
>75	17:70.8	4:16.7	1:4.2	2:8.3	24:100

TABLE X

TRANSPORTATION REQUIREMENTS: BY LEVEL OF FACE-TO-FACE CONTACT

Personal contact at an office (%)	Transportation Requirements (#:%) public transit	Parking (crown & employee vehicles)	Parking (clients)	Total #:%
≤50	30:75.0	4:10.0	6:15.0	40:100
>50 ≤75	7:77.8	1:11.1	1:11.1	9:100
>75	16:69.6	5:21.7	2:8.7	23:100

For most decision-makers, the central area affords the best combination of transport modes. Services dependent upon adequate bus connections for their clients and employees are apparently confined to the city centre. In part, it is the attitudes of the decision-makers which reinforce the importance of the central area as a focal point for

service locations. The following comments from one respondent illustrates the pre-eminence of the central region:

> In order to provide service to the broadest extent of of the general public we must be located in a central area that provides easy access to the office for the public and staff from all parts of the city...

In general, respondents voiced similar commitments to the transportation requirements of their clients. At the same time, respondents invariably made reference to the overall distribution of their clients; for example, the following locution offered by the Court of Canadian Citizenship, Secretary of State:

> ...buses from all areas of the city stop within these locations [city centre]. These...facilitate customers from throughout the city coming to our office...

Some services, for example, Canadian Penitentiary Service and the Weather Forecast Service of Environment Canada have a smaller, more identifiable clientele which is location specific. These services tend to be drawn towards the location of their clients, rather than a central location which is well-serviced by public transit routes from most points in the city.

Low contact services, unless their clients are in the central area, are more flexible in their location requirements. Public transit is important for all three groups, but the availability of parking space is the main problem mentioned by the low contact group. Since clients infrequently visit the offices of low contact services, the greatest concern is for the movement of employees in the journey to work and during the working day. The Department of Agriculture

epitomizes low contact services with parking problems. According to the respondent from the Fruit and Vegetable Division:

> Clients are located at the periphery [of Edmonton] and only a few come to the office to obtain services. However, employees must visit the honey plant and potato processing plant. The problem is finding parking space near the building when employees return.

Consumer-oriented services, regardless of the amount of office contact carried out with clients, are committed to the efficient performance of activities which directly involve their clients. In contradistinction, however, their location requirements differ in that low contact services are principally interested in the movement of employees, while the higher contact groups need a location that clients can reach with relative ease.

LOCATIONAL CRITERIA ACCORDING TO THE TYPE OF SERVICE PROVIDED

Two important functional relationships of consumer-oriented services have been identified: the activities which take place between the client and a government employee; and the business which occurs between interrelated government activities. Both types of activities have overt spatial properties linked to accessibility, spatial proximity, and the availability of suitable transportation services. The spatial properties of services vary in accordance with the level of face-to-face contact taking place at a service location. The spatial characteristics of services also vary among different types of services, but the distinctions are less recognizable than spatial differences

among the three contact levels.

Consumer-oriented services in Edmonton have been classified on the basis of the purpose of the client's visit to an office. The classification scheme was derived from brief descriptions of services furnished by respondents. Although it was difficult to devise mutually exclusive categories, a simplistic scheme was formulated and cross-tabulated with the questionnaire data.

Consumer-oriented services surveyed in Edmonton can be broken into a total of six categories which are reducible to three basic types (TABLE XI). Precisely 80 per cent (54) of the services given in TABLE XI are dominated by some form of information exchange or processing. Type 5 services comprise 12.4 per cent of all services and are characterized by non-information oriented activities, for example, health services, and the post mortem examination of animals by the Health of Animals Branch, Department of Agriculture. Type 6 services have an obvious retail function, since they are predominantly involved with providing goods and services having a direct cost to the consumer.

The questionnaire findings indicate that few locational differences exist among the three types of services. Between group variations are usually not as great as within group differences.

According to TABLE XII, the information group (Types 1, 2, 3, and 4) and Type 5 services are largely confined to the centre of Edmonton, whereas greater variation in areal preference is exhibited by Type 6 services. Post Office for example, offers Type 6 services such as the

TABLE XI

CLASSIFICATION OF CONSUMER-ORIENTED SERVICES IN EDMONTON, 1975

Type of Service	Functions	Basic Type	Number of Services	Per Cent of Total
Type 1:	Dispensing information	Information-oriented	18	24.8
Activities:	public education, including written materials and films; public enquiries and complaints; advisory and referral services.			
Examples:	Information Canada; Citizenship Branch, Secretary of State; Unemployment Insurance Commission, National Film Board.			
Type 2:	Collecting information	Information-oriented	11	15.2
Activities:	Interviews; investigations; surveys.			
Examples:	Manpower; Royal Canadian Mounted Police; Statistics Canada.			
Type 3:	Processing information	Information-oriented	11	15.2
Activities:	Research; licensing; applications; judicial process.			
Examples:	Energy, Mines and Resources; Ministry of Transport; Unemployment Insurance; Federal Court.			
Type 4:	Combination of information dissemination, collection or processing		14	18.6
Examples:	Health of Animals Branch, Department of Agriculture; Personnel Branch, Environment Canada.			
Type 5:	All services not predominantly involved with information exchange or processing.	all other services	9	12.4
Examples:	Health and Welfare; National Film Board.			
Type 6:	Provision of goods, excluding written materials and films of the Type 1 category.	goods	10	13.8
Examples:	Post Office; Veterans Land Act, Veterans Affairs; Regional Passport Office, External Affairs.			

sale of stamps and money orders. The goods offered by Post Office are required frequently and cannot be dispensed efficiently from a single city centre outlet. The Regional Passport Office, on the other hand, is a Type 6 service with a smaller clientele than Post Office. In common with most federal services which serve only particular sections of the population the Regional Passport Office prefers the central area to other areas of the city.

TABLE XII

AREA OF THE CITY PREFERRED: BY TYPE OF SERVICE

	Type of Service (#:%)		
	1(1,2,3,4)	5	6
Centre of Edmonton	35:67.3	7:77.8	3:30.0
Inner City	14:26.9	--	5:50.0
Attached Suburbs	3:5.7	2:22.2	--
Detached Subrubs	--	--	--
Urban Fringe	--	--	2:20.0
Rural	--	--	--
Total #:%	52:100	9:100	10:100

Although federal consumer-oriented services are not subject to the same economic interpretation as private goods and services, it appears that the location of the former group could be partly explained by central place concepts such as thresholds and service areas. In central place theory, a central function has a threshold level of sales

which defines the service's minimum level of subsistence. The size of the area containing the threshold of sales varies with the order of the good: high order goods have larger service areas than lower order goods. The service areas of federal consumer-oriented services cannot be defined strictly by reference to direct sales, however. The relevant unit of observation should perhaps be based on the proportion of the entire population to which the quantity of the service is available, as well as the frequency of use. Post Office provides services which are required frequently by a large proportion of the entire population. Thus, Post Office can maintain a system of branch offices with small service areas. On the other hand, the Regional Passport Office provides an infrequently needed commodity, passports, which is required by a relatively small proportion of the population. Hence, it operates from a single city centre location and has a large service area.

Clearly, differences in attitudes to locational criteria expressed by federal management cannot be explained by reference to the simple classification scheme outlined in TABLE XI. Indeed, reference to the type of service does not reveal any major differences in transportation, or accessibility requirements. Moreover, cross-tabulations of the questionnaire data revealed no differences for the other locational criteria, activity and land use associations.

In retrospect, the analysis could have been improved by designing a questionnaire which probed more deeply into the location requirements of particular services. Although respondents were requested to

describe why they favoured certain locational criteria, they rarely offered any detailed discussion. Respondents should have been directed to answer more specific questions concerning the nature and distribution of their clients, the percentage of all clients who travel to the office by bus, car and other modes of transport, and precise statements on the business transacted with other federal services, for example.

Finally, the questionnaire findings suggest that many federal departments are not overtly concerned with the locational needs of their services. In fact, only nine of the twenty-eight respondents who returned the questionnaire stated that their department issued official guidelines to be followed in the selection of an office. Six respondents (21.4 per cent) did not know whether guidelines were available or not, and a large proportion, 42.8 per cent, stated that guidelines do not exist.

Usually, the location guidelines in existence merely state a preference for some general area of the city or proximity to a closely related function. There is little evidence to suggest that most departments carry out intensive location research at the intra-urban scale. A cross-section of the location requirements suggested by federal guidelines illustrates the problem. For offices of the Social Insurance Branch, Department of Health and Welfare, "central location" and "parking" are the principal locational criteria. The criteria for Canada Immigration Centre, Department of Manpower and Immigration, are remarkably similar: "central location" and "easy access by public and private transportation". It is not surprising therefore, that respondents could

not elaborate on the reasons for their choice of certain locational criteria.

CONCLUSIONS

Consumer-oriented services have location requirements which can be traced to two basic activity patterns integral to the efficient provision of the services. First, the most important factor for most services is accessibility for clients or employees, depending on the proportion of clients visiting an office. In general, employee accessibility is most important for services which have little face-to-face contact with clients at an office. Client accessibility is of paramount importance for high contact services.

Second, most services have few relationships with non-governmental functions in the CBD, but are closely linked either to services in the same department or to other government units. Inter- and intra-departmental relationships appear to be the main reason why low contact services need to be in the central area. For high face-to-face contact services, respondents, on average, agreed that they need to be near concentrated bus routes in the central retailing district. Few services appear to have location requirements which are governed principally by the location of non-governmental activities.

Several generalizations which can be tested against reality emerge from the analysis. First, at least two-thirds of all consumer-oriented services will be found in the central area of cities. More-

over, most services will occupy a commercial land use site. Second, the distribution of offices which house services with high levels of face-to-face contact occurring at an office will be concentrated near the focus of converging bus routes. A related notion is that low face-to-face contact services will be housed in offices outside the CBD. Finally, the functional relationships that exist among and within federal departments suggest that federal offices will be more clustered than randomly distributed.

The extent to which the generalizations hold in reality will provide an indication of the spatial efficency of federal services as interpreted by decision-makers. Departures from government norms based on management attitudes will suggest a level of dissatisfaction with the present spatial organization of federal services and will shed light upon the presence of other factors involved in the locational choice process.

Chapter V

THE LOCATION OF FEDERAL SERVICES IN THE CENTRAL AREA OF EDMONTON, 1915-1975

In 1974, the federal government owned and leased 810,000 square feet of rentable office space in Edmonton.[1] This space is distributed mainly north of the North Saskatchewan River in the CBD and its environs (Figure 6). The concentration of services in the city centre comes as no revelation. Neither simple observation nor the attitudes of federal decision-makers suggest any other locational pattern. Yet, it is not known how federal offices and services have behaved in space to form the present spatial system.

In this chapter an attempt is made to ascertain the relationships between service locations and spatial characteristics of the centre of the city through time. Specific themes include (1) describing changes in the distribution of offices and services relative to certain growth features of the city centre, and (2) determining the predominant factors which have likely influenced the present distribution of offices and services. Finally, a descriptive model which summarizes the salient spatial traits of the system of federal offices and services in a historical context is presented.

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[1] Canada. Department of Public Works. Edmonton Forward Plan, 1974.

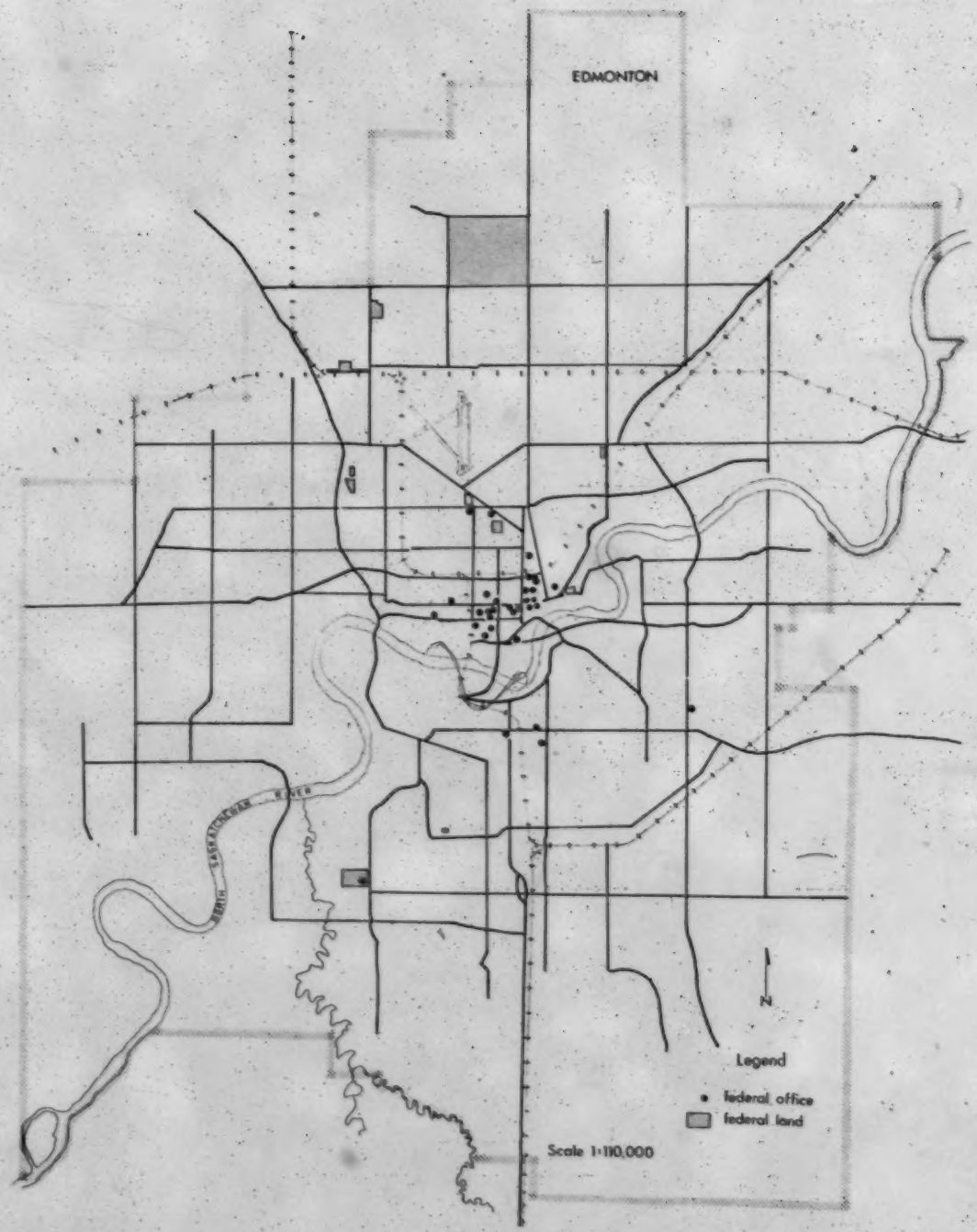

Fig. 6 The location of federal land and offices in Edmonton, 1975.

DESCRIPTIVE TECHNIQUES APPLICABLE TO A SPATIAL ANALYSIS OF FEDERAL OFFICES AND SERVICES

A tractable explanation of federal facility and service location should be possible if the particular locational decisions made by the government are known. An analysis of federal decision-making would provide valuable information on the development of locational attitudes, on locational adjustments in response to changes in the urban environment, and on the role played by relationships among federal services and their clients and interrelated activities in the choice of a location. Unfortunately, the research would be prohibitively time-consuming, even if it were possible. An alternative approach is to observe past locational trends and, by inference, to suggest the factors which seem most likely to govern the distribution of offices and services in the city centre.

Measurement of Historical Trends

Centrographic measures complemented by the nearest neighbour statistic establish a quantitative basis for describing spatial changes in the concentration, linearity, and development of federal offices and services. The locations of offices and services in the downtown district of Edmonton were mapped for each five year interval extending from 1915 through 1975. Calculations are based on the distributions which existed at the end of each five year period.

Centrographic Measures. A map of the central portion of Edmonton at a scale of 1:12,000 was overlain with a square grid having a cell width of 500 feet (152.34 metres). Offices were given coordinate positions to the nearest tenth of a unit thereby providing a fairly accurate mapping of actual locations. The X-axis was designated as the east-west bearing.

An analysis of the output of the centrographic program indicated that the distributions of offices and services are not bivariate normal in some time periods. A second computer run was made following adjustments to the data. Specifically, the mean centre is very sensitive and is pulled toward extreme points. Thus, it was decided to omit one office located north of the Canadian National Railways from the calculations. Including this office distorted the actual orientation, shape and size of the distributions. As well, the distributions for 1960, 1970 and 1975 are bi-modal. To make them applicable to centrographic measures, the distributions for each of the three periods were divided into two sub-problems. Finally, the data for 1965 were not included in the centrographic analysis because the offices were too widely dispersed to derive any meaningful measure of their distribution.

The second computer run produced a larger concentration of data points within each standard ellipse; and a circle described by the length of the standard radius indicated that the data sets are approximately bivariate normal. Thus, minor adjustments to the data produced a standardized series of data sets. This facilitiates a comparison of centrographic measures of federal offices and services taken through time, and the normality of the data suggests that federal services and

offices possess distributional properties which make them susceptible to inferential analysis by areal statistics.

Nearest Neighbour Analysis. The efficacy of the nearest neighbour statistic depends upon the choice of an area which is representative of the data set under investigation. In this study, the problem was to determine suitable boundaries for the central area and the central business district of Edmonton (Chapter III). Differences in public transportation between the central business district and the frame influence the ease with which federal clients get to, and obtain a service. Since services must be accessible to clients and in proximity to interrelated federal activities, widely spaced services in the frame are less efficient, in a spatial sense, than services clustered within the central business district.

The nearest neighbour statistic is calculated for the distribution of offices and services within the CBD and the central area at five year intervals extending from 1915 to 1975. The R value is used to compare the distribution of federal offices with the spacing of services, and to note spatial trends in the distributions through time.

SPATIAL ORGANIZATION OF OFFICES AND SERVICES IN EDMONTON'S CENTRAL AREA, 1915-1975

Numerical Growth of Offices and Services

Federal offices and services experienced absolute increases

during the study period. The number of offices in Edmonton's central area grew from nine to thirty-one between 1915 and 1975, and the number of services increased from thirteen to sixty (Figure 7). Whereas the growth rate for services has been fairly constant, since 1925, office expansion has been erratic, with high growth cycles occurring in the war years 1940-1945, and the decade 1965-1975. Six of the ten new offices established between 1940 and 1945 were occupied by wartime departments, such as the Regional War Labour Board (10064 Jasper Avenue), and Wartime Prices and Supplies (9813 Jasper Avenue). By 1960, most of these departments had been either phased out of existence or incorporated into the Department of National Defence.

The number of federal offices almost tripled from eleven to thirty-one in the period 1965-1975. This decade of rapid growth was brought on by the formation of new portfolios and programs, by the internal growth of existing departments, and by the pressures caused by the development and redevelopment of the central business district.

Other than in the two periods of rapid expansion, the number of offices tended to remain nearly the same, between nine and eleven. To accommodate increasing numbers of public employees, the government has had to acquire increasingly larger office structures and to lease greater proportions of space within individual office buildings. It can be concluded from Figure 7 that an implicit policy of the Government of Canada is to house as many services as possible within a limited number of facilities. In the short run, the number of offices increases, but leased offices and obsolete buildings will be discarded eventually

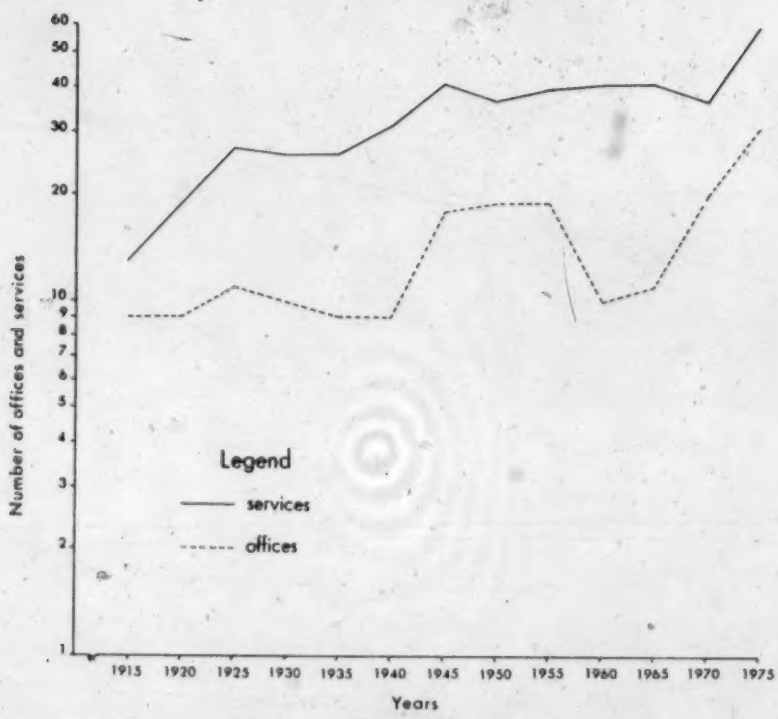

Fig. 7: Growth rates of federal offices and services in Edmonton's central area, 1915-1975.

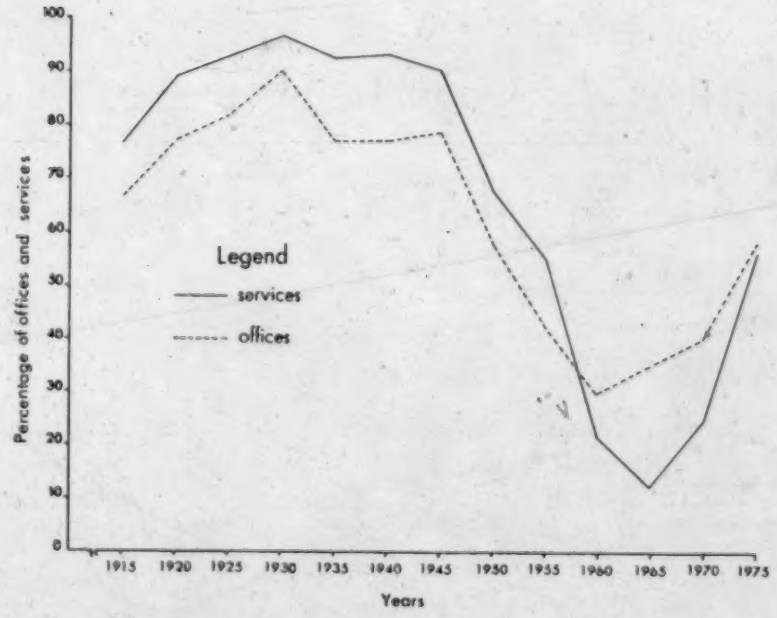

Fig. 8: Percentage of federal offices and services in Edmonton's CBD, 1915-1975.

in favour of a single office complex. In fact, the federal government recently proposed a sequential program of office construction in the vicinity of the Civic Centre in downtown Edmonton. The first phase of the program would be completed by 1979.[2]

It is expected that services presently located in the Sir Alexander MacKenzie Building (9808 - 103 Avenue), the Sprague Building (9943 - 109 Street), the Federal Building (9820 - 107 Street), and the Oliver Building (10225 - 100 Avenue) would relocate to the proposed complex between 1980 and 1985. Also, most departments which currently occupy leased space in the city centre would be relocated. By 1985, if the plan is followed, government services in the central area will be housed within approximately one dozen facilities, a level which is comparable to the number of offices in 1915 (Figure 7).

Although services increased in nearly every time period (Figure 7), the federal government has maintained proportionately fewer offices to accommodate these services. In part, this can be attributed to the differences among growth rates of existing departments and the formation of new departments. Most of the increase in services up to 1975 was a result of existing departments taking on new functions. Nevertheless, the number of departments increased by 53 per cent during the sixty year period. Whereas many services had their own offices early in the study period, most departments now share a facility with other departments.

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[2] Ibid.

The propensity to find shared accommodation within a few large facilities is a short-lived proposition, however. Shortly after crown-owned buildings become occupied, the number of leased structures begins to rise. In one case, the federal government owned one new facility in downtown Edmonton in 1958, the Federal Building (9820 - 107 Street). By 1960, 63 per cent of all federal services within the central area had moved into the structure. This proportion increased to 79 per cent in 1965, but by 1970, only 35 per cent remained. It appears that the supply of space for services keeps pace with demand, but much of the supply is in the form of leased accommodation. It does not appear that government-owned buildings have been a successful method for providing long-term accommodation to large groupings of departments.

Location and Relocation of Federal Offices and Services Within the Central Area

There is a relationship between the growth and decline of office numbers and changes in the proportion of federal offices and services found in the central business district. A comparison of Figures 7 and 8 reveals the positive nature of this relationship: the proportion of services within the central business district increases during periods of office expansion, and declines when the quantity of offices drops. Two related reasons can be put forth to explain the relationship.

First, phases of office growth rely primarily on the availability of leased accommodation. Conversely, when the total number of offices

is in a state of decline, leased accommodation and functionally obsolete structures owned by the government are discarded in favour of larger, government-owned structures. Until 1945, most of the space rented by the federal government was in the central business district, although the data do not suggest why this should be. During periods of growth in the number of offices, a proportionately greater share of federal services will be found in the CBD.

Alternatively, when the Government of Canada purchases or constructs office facilities, it seeks sites in the frame, near the CBD. Services provided with space in these buildings are drawn from the CBD.

Second, growth factors inherent in the central business district itself may have caused services to migrate to the frame. The proportion of services found in the frame has been increasing since 1930, but in particular, after 1945 (Figure 8). The movement of federal services from the CBD closely parallels in time the locational shift undergone by many low face-to-face contact services and the general office sector[3], after 1945. Bannon notes that a massive relocation of offices occurred around 1950, west of 102 Street and south of Jasper Avenue[4]. This process continued into the 1960's when other developments, for example,

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[3]The general office sector, according to Bannon, includes a variety of office functions, including company headquarters, government and organizational activities. Michael J. Bannon, The Evolution of the Central Area of Edmonton, Alberta, 1946-1966. (unpublished M.A. thesis), Department of Geography, University of Alberta, 1967, p. 11.

[4]Ibid.

the CN Tower (10004 - 104 Avenue), Chancery Hall (Sir Winston Churchill Square), and Edmonton Public Library (Sir Winston Churchill Square), took place northeast of the peak land value intersection.[5]

Historical Trends in Location and Relocation

The need for leased accommodation and the distribution of office supply within the central area are two principal factors influencing the spatial organization of federal offices and services in Edmonton. Not only has the areal focus of federal location and relocation changed through time, but also, the spatial properties of the federal service system have been transformed.

Between 1915 and 1935, federal services were located predominantly within the old commercial district (Figures 9 to 13). Most office movement occurred within 1050 feet (320 metres) of the main federal building of that period, the Edmonton Central Post Office (100 Street and 101A Avenue). The number of services more than doubled during the same period, but most of these were accommodated in offices surrounding the post office, well within the CBD.

The location of offices and services which proliferated during World War II was confined to Jasper Avenue near the original nucleus of federal offices (Figures 14 and 15). As in earlier time periods, most moves were short, and the rate of relocation of existing services did not

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[5] Ibid.

Fig. 9: The location of federal offices and services in the central area of Edmonton, 1915.

Fig. 10: The location of federal offices and services in the central area of Edmonton, 1920.

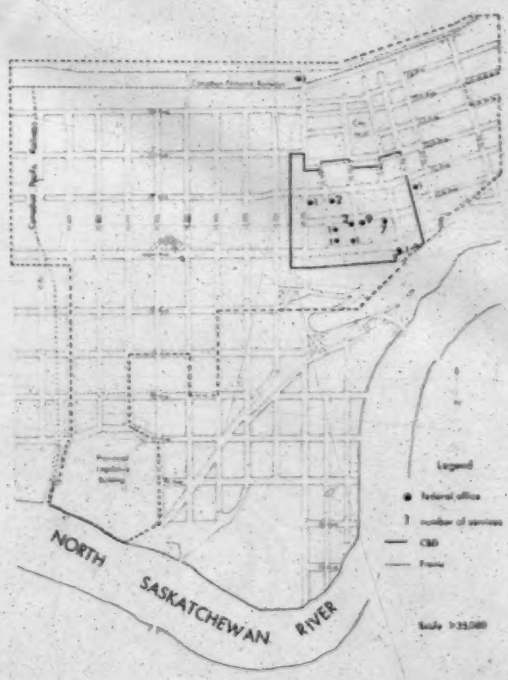

Fig. 11: The location of federal offices and services in the central area of Edmonton, 1925.

Fig. 12: The location of federal offices and services in the central area of Edmonton, 1930.

Fig. 13. The location of federal offices and services in the central area of Edmonton, 1935.

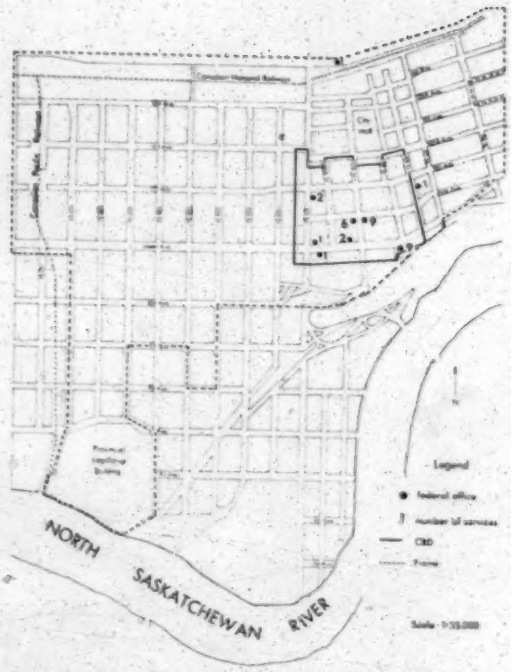

Fig. 14. The location of federal offices and services in the central area of Edmonton, 1940.

Fig. 15. The location of federal offices and services in the central area of Edmonton, 1945.

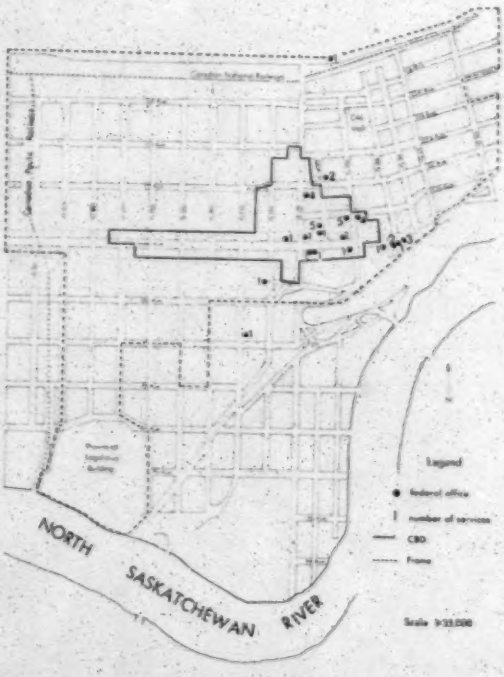

Fig. 16. The location of federal offices and services in the central area of Edmonton, 1950.

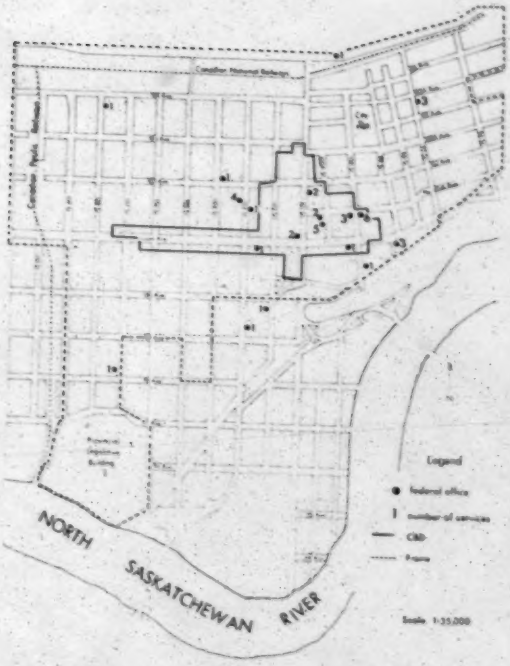

Fig. 17: The location of federal offices and services in the central area of Edmonton, 1955.

Fig. 18: The location of federal offices and services in the central area of Edmonton, 1960.

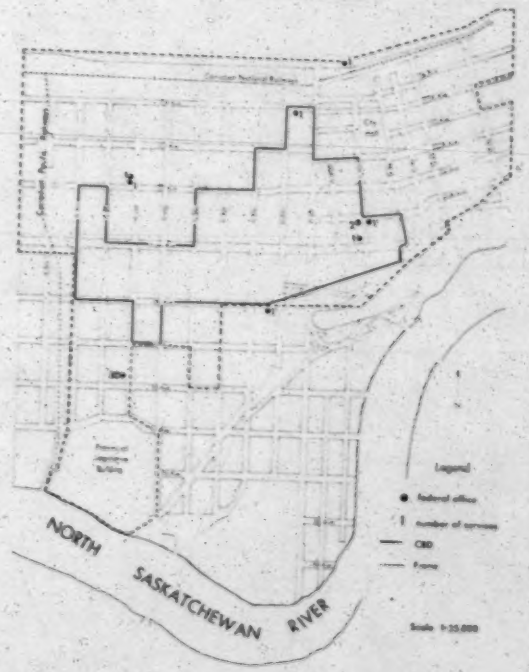

Fig. 19: The location of federal offices and services in the central area of Edmonton, 1965.

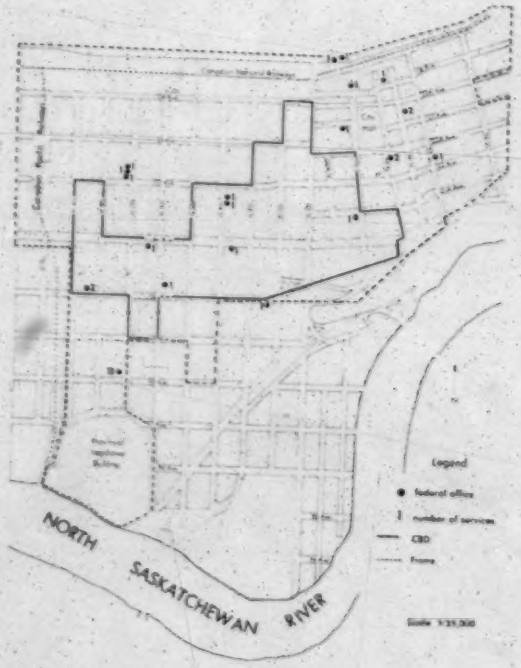

Fig. 20: The location of federal offices and services in the central area of Edmonton, 1970.

Fig. 21: The location of federal offices and services in the central area of Edmonton, 1975.

increase until the period 1941-1945 (TABLE XIII). An underdeveloped street pattern and the lack of available office space were two important physical limitations on the dispersion of offices until then.

TABLE XIII

THE LOCATION AND RELOCATION OF SERVICES, 1915-1975

Period	Number of new services located and existing services relocated	Number of new offices and relocations per service
1915-1920	5	0.31
1921-1925	15	0.68
1926-1930	10	0.38
1931-1935	3	0.12
1936-1940	5	0.18
1941-1945	14	0.39
1946-1950	30	0.77
1951-1955	47	1.22
1956-1960	37	0.91
1961-1965	10	0.24
1966-1970	5	0.13
1971-1975	19	0.39
Total:	200	Median 0.34

After 1945, a stimulated local economy and population growth provided the impetus for expansion of the city centre. Federal offices began to be forced into the frame as competition increased

for valuable CBD space and land values rose. As TABLE XIII shows, location and relocation occurred frequently between 1945 and 1960. The rate of movement of services reached its highest level in the period 1951-1955 and did not return to the level of earlier time periods until the period 1961-1965. First offices, then services, shifted west along Jasper Avenue and southwest towards the Provincial Legislative Building (Figures 16 and 17). Although the number of new services increased slightly from thirty-seven to forty-one, these and most existing services were located in the frame by 1960.

By 1950, only 42.1 per cent of federal services remained in the central business district, compared with 77.7 per cent in the previous time-period (Figure 8). Many services which left the CBD between 1945 and 1960 first moved into leased space, then into semi-permanent accommodation in the Federal Building (9820 - 107 Street) after 1958. Towards the end of 1960, 63 per cent of all federal services in the central area were contained within the Federal Building, and by 1965, the Government of Canada maintained only nine offices which were scattered throughout the central area (Figures 18 and 19).

After 1965, office rental focused on two-sectors, one along a north-south axis between 106 and 109 Streets, the other in the north-east surrounding City Hall (Figures 20 and 21). Although 58 per cent of federal offices and 56.6 per cent of all central area federal services had returned to the CBD by 1975, the centres of gravity of offices and services had moved considerably.

Mean Centre of Federal Offices and Services. Between 1915 and 1945 the centres of gravity of offices and services revolved clockwise around the 100 Street - 101A Avenue intersection, the location of the McLeod Building and the Edmonton Central Post Office (Figures 22 and 23). Nevertheless, the distributions remained centred on the 100 Street - 101A Avenue intersection. A sample of the fifty-two moves made by services between 1915 and 1950 indicates that most moves were short and focused on the immediate vicinity of the post office and the McLeod Building (Figure 24). For thirteen of the more mobile departments, only 36.4 per cent (33 moves) located or relocated outside the CBD. After 1950, however, 76.19 per cent (42 moves) made by the same departments took place within the frame and from the CBD to the frame.

Movement from the CBD to the frame and the original location of many new services in the frame produced major changes in the mean centres of offices and services after 1945. The centre of gravity of offices was located near 100A Street and Jasper Avenue in 1950, and by 1960 it had moved northwest to 101 Street and 101A Avenue (Figure 22).

As early as 1960, three concentrations of services began to emerge. These were well established in 1970 and have since been strengthened. The present pattern consists of a group of offices near the original post office, and another concentration directly north of the first around City Hall (hereafter called the northeast sector). A third cluster is located further west, between 104 Avenue and the Provincial Legislative Buildings (hereafter called the southwest sector). Within sixty years, the distribution of offices and services has changed

Fig. 22: Mean centre of offices, 1915 - 1975.

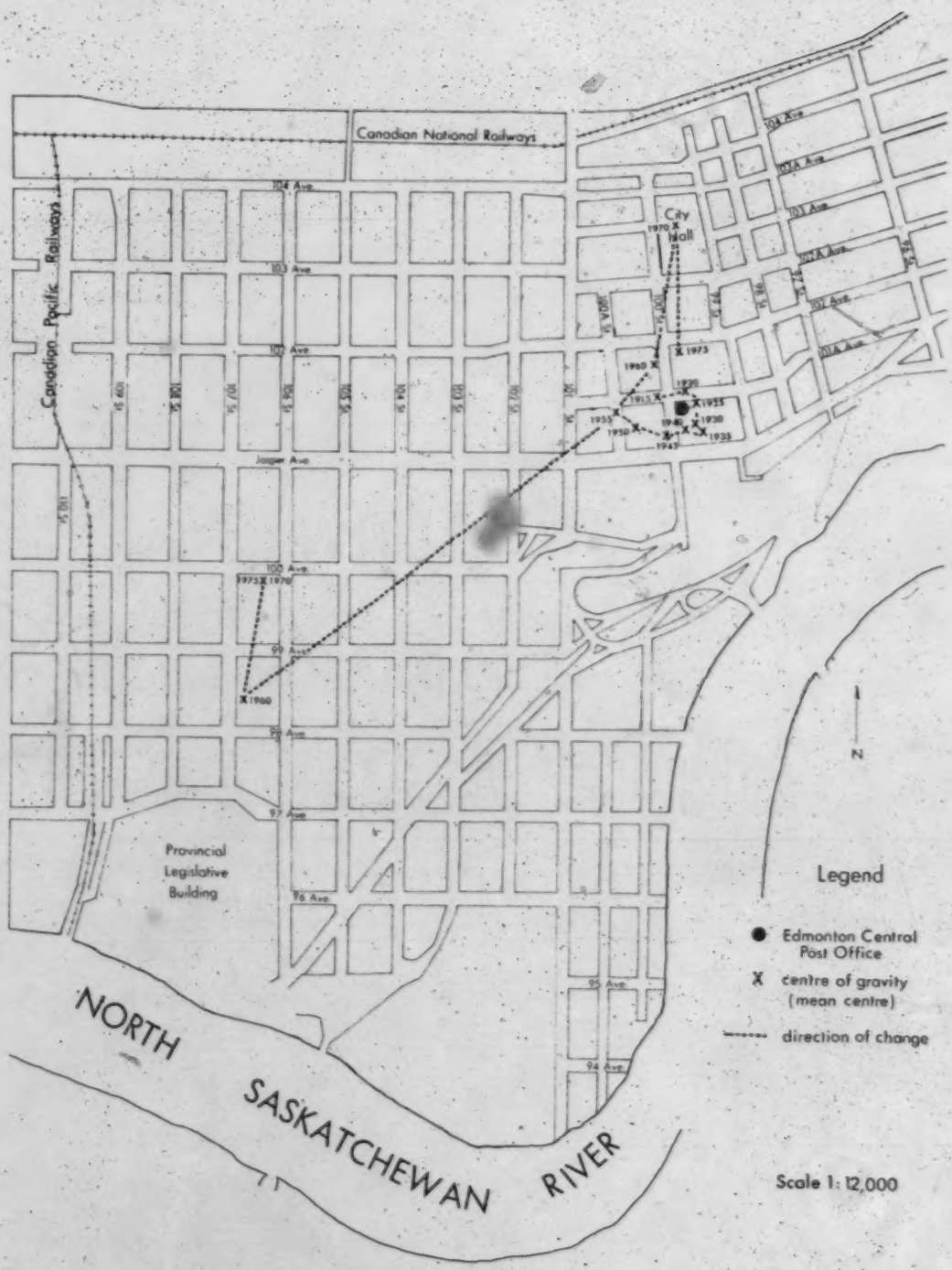

Fig. 23: Mean centre of services, 1915–1975.

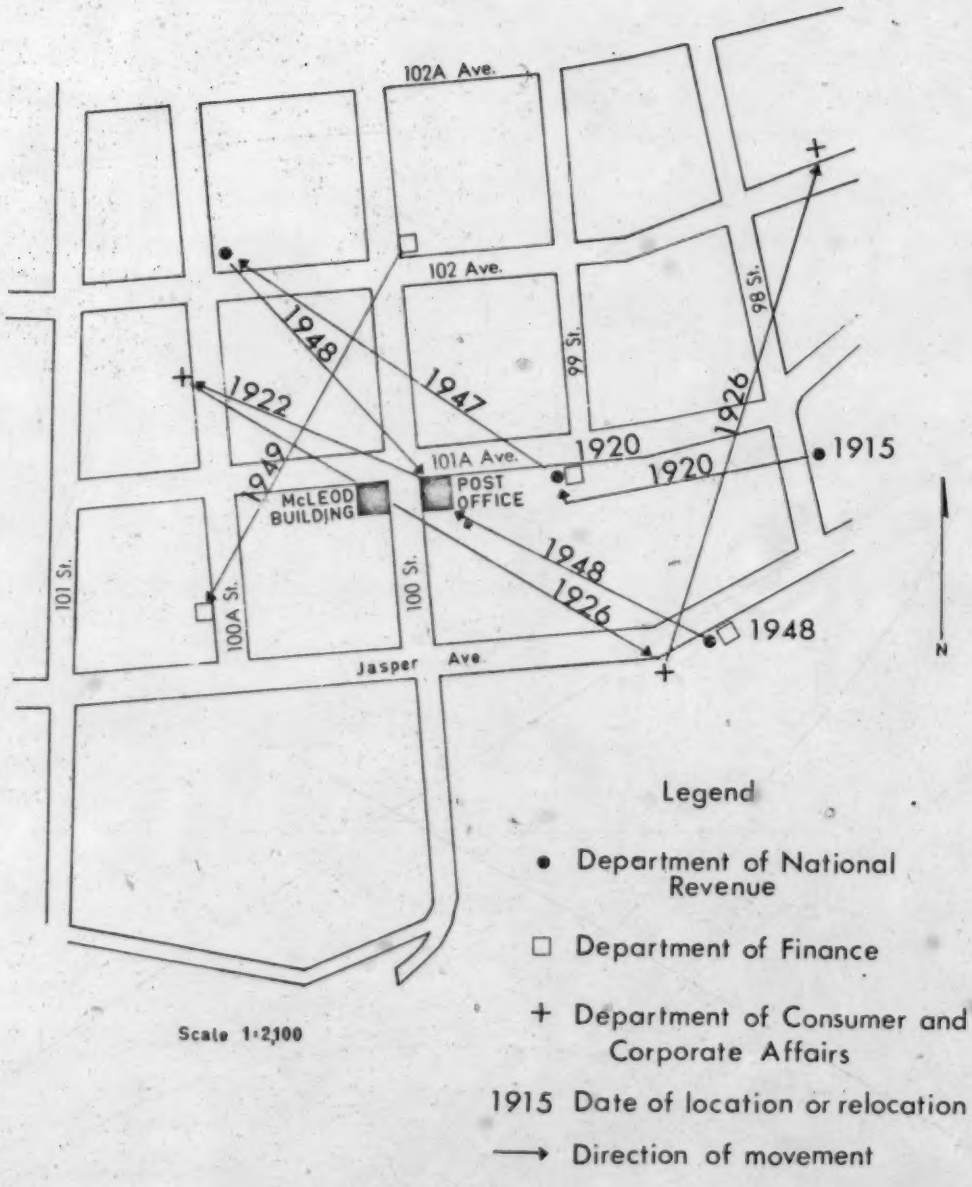

Fig. 24: Location and relocation of three federal departments in the central area of Edmonton, 1915-1950.

from an agglomerated pattern with a single focus to a tri-nodal, less agglomerated distribution.

The Distribution of Federal Offices and Services. Federal offices and services have shown signs of uniform spacing and clustering within the CBD (TABLE XIV). Throughout the study period the R values fluctuate between 0.668 (1945) and 1.617 (1970), indicating slight tendencies to cluster, and fairly strong tendencies to form a uniform pattern respectively. On average there is no clear tendency for offices to form either a uniform or a clustered pattern within the central business district.

Between 1915 and 1940, offices tended to become uniformly distributed within the CBD. This is related to the proliferation of leased space within the CBD until 1940. Between 1940 and 1965, offices moved into the frame towards the western perimeter of the CBD and north around City Hall. During this period, offices within the CBD exhibited signs of clustering. When offices began to migrate back into the CBD between 1965 and 1975, the pattern became more regular.

Separate R calculations for the entire central area indicate that offices have become less clustered (TABLE XV). In 1935, offices were most clustered (R = .464), but by 1975, offices had dispersed throughout much of the central area (R = .626). Two observations emerge from the R statistics. First, there is a correlation between pattern and the movement of offices. Offices tend towards a regular pattern when the number of offices within the CBD is increasing, but they can display periodic signs of clustering when the number of offices is descreasing or

increasing. Second, the general westward and northward relocation of services has caused the dispersion of offices. While offices remained in the CBD it was possible to maintain a high level of spatial proximity among federal services. Since leaving the CBD, however, the distance separating offices has increased. It is likely that the greater availability of office sites over a wider area in the frame influenced the spread of federal offices after 1925. The federal government is mainly interested in finding low cost accommodation. The variablity in rental costs and site values in the frame is greater in the frame than in the CBD. This could have produced changes in the spatial configuration of offices. As well, dispersion was influenced by the outward shift of municipal and provincial government functions from the CBD.

Concentration of Federal Offices and Services. Since particular departments may offer more than one service from a single facility, services are usually more concentrated than offices. Throughout the study period, services exhibit greater clustering than offices (TABLE XVI); not only has the proportion of services contained within the standard deviational ellipses been larger, but also, services are distributed over a smaller area.

The ellipse area containing the data points has become progressively larger since 1940 (TABLE XVI). According to TABLE XVI and Figures 25 to 28, the area of the ellipse expands as the mean centre of offices shifts westward towards the edge of the CBD. The ellipse area for

services has changed in a similar manner (Figures 39 to 53). The ellipse area of offices is two to three times larger in the southwest sector than in the northwest sector, but between 1970 and 1975, the ellipse area of services in the southwest sector became smaller while in the northeast sector, the ellipse area increased.

TABLE XIV

NEAREST NEIGHBOUR STATISTIC FOR FEDERAL OFFICES IN THE CBD, 1915-1975

Year	N	R_O	R_E	$R(R_O/R_E)$
1915	6	0.543	0.651	0.908
1920	7	0.403	0.602	0.669
1925	9	0.579	0.531	1.090
1930	9	0.464	0.531	0.874
1935	7	0.803	0.602	1.333
1940	7	0.743	0.602	1.233
1945	15	0.275	0.4115	0.668
1950	11	0.397	0.503	0.790
1955	8	0.700	0.590	1.187
1960	3	2.930	0.700	0.727
1965	4	1.138	1.356	0.839
1970	8	1.550	0.959	1.617
1975	3	0.883	0.752	1.174

TABLE XV

NEAREST NEIGHBOUR STATISTIC FOR FEDERAL OFFICES IN THE CENTRAL AREA, 1915-1975

Year	N	R_O	R_E	$R(R_O/R_E)$
1915	9	1.334	1.855	0.719
1920	9	0.924	1.855	0.498
1925	11	0.992	1.678	0.591
1930	10	0.818	1.760	0.465
1935	9	0.862	1.855	0.464
1940	9	1.302	1.855	0.702
1945	19	0.884	1.277	0.692
1950	19	0.728	1.277	0.570
1955	19	1.053	1.277	0.824
1960	10	1.762	1.760	1.001
1965	9	1.676	1.855	0.903
1970	20	1.029	1.244	0.826
1975	30	0.636	1.016	0.626

TABLE XVI

CONCENTRATION OF FEDERAL OFFICES AND SERVICES, 1915-1975

Year	Ellipse Area (in units^2)		Concentration (% weights within ellipse)	
	Offices	Services	Offices	Services
1915	1.628	1.710	37.5	58.3
1920	1.043	0.647	46.6	44.4
1925	1.186	0.597	40.0	69.2
1930	0.797	0.446	44.4	48.0
1935	1.226	0.719	57.1	58.3
1940	1.627	0.934	37.5	50.0
1945	2.251	1.732	52.9	41.0
1950	2.652	2.174	50.0	55.0
1955				
1960	-	-	-	-
1965	-	-	-	-
1970 (northeast sector)	2.681	2.033	44.4	53.8
1970 (southwest sector)	7.600	7.331	18.1	62.5
1975 (northeast sector)	3.543	3.200	13.3	8.3
1975 (southwest sector)	6.209	4.735	33.3	36.1

MEAN CENTRED ELLIPSES OF OFFICES, 1915-1975.

Fig. 25: Standard ellipse of offices, 1915.

Fig. 26: Standard ellipse of offices, 1920.

Fig. 27: Standard ellipse of offices, 1925.

Fig. 28: Standard ellipse of offices, 1930.

Fig. 29: Standard ellipse of offices, 1935.

Fig. 30: Standard ellipse of offices, 1940.

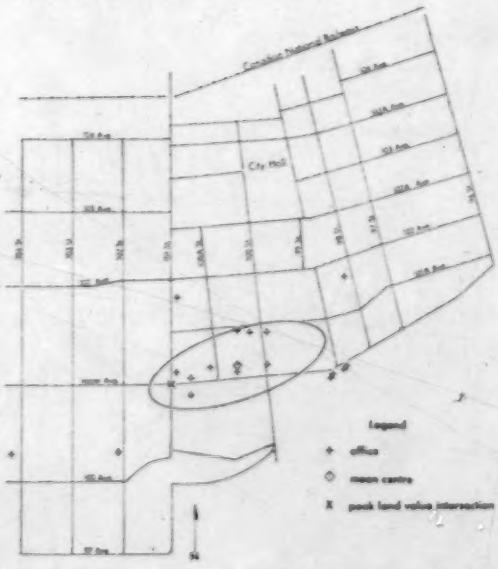

Fig. 31: Standard ellipse of offices, 1945.

Fig. 32: Standard ellipse of offices, 1950.

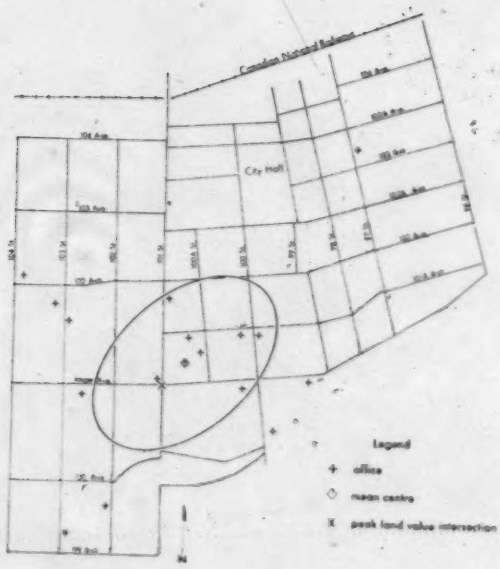

Fig. 33: Standard ellipse of offices, 1935.

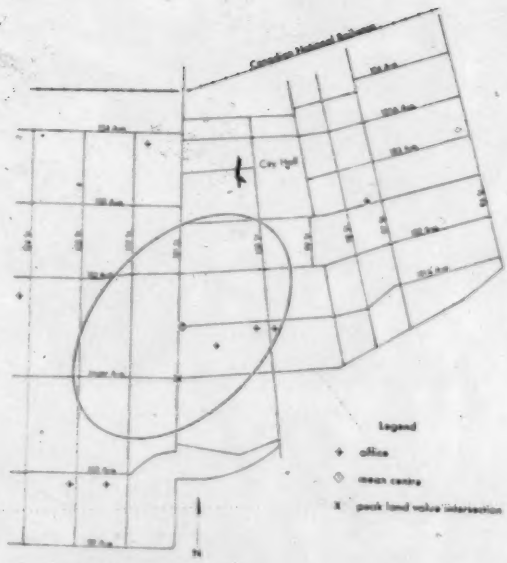

Fig. 34: Standard ellipse of offices, 1960.

Fig. 35: Standard ellipse of offices (northeast sector), 1970.

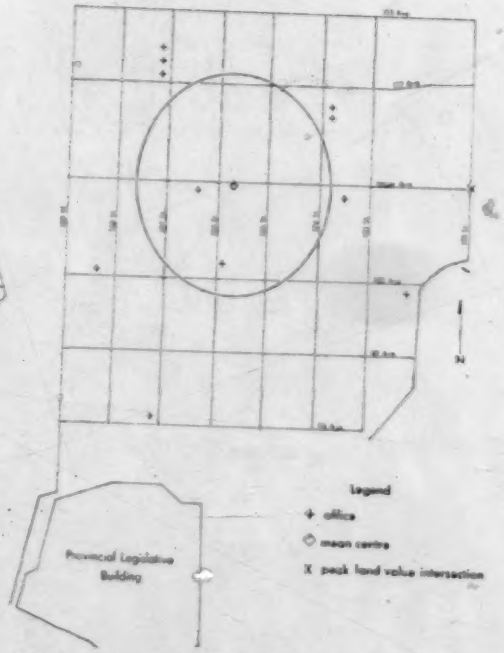

Fig. 36: Standard ellipse of offices (southwest sector), 1970.

Fig. 37: Standard ellipse of offices (northeast sector), 1975.

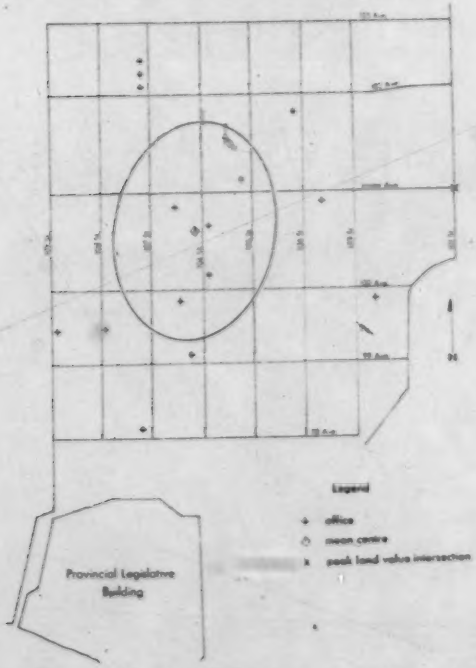

Fig. 38: Standard ellipse of offices (southwest sector), 1975.

MEAN CENTRED ELLIPSES OF SERVICES, 1915-1975.

Fig. 39: Standard ellipse of services, 1915.

Fig. 40: Standard ellipse of services, 1920.

Fig. 41: Standard ellipse of services, 1925.

Fig. 42: Standard ellipse of services, 1930.

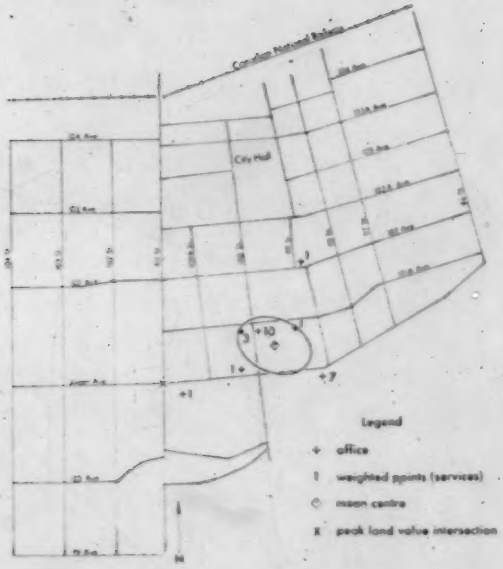

Fig. 43: Standard ellipse of services, 1935.

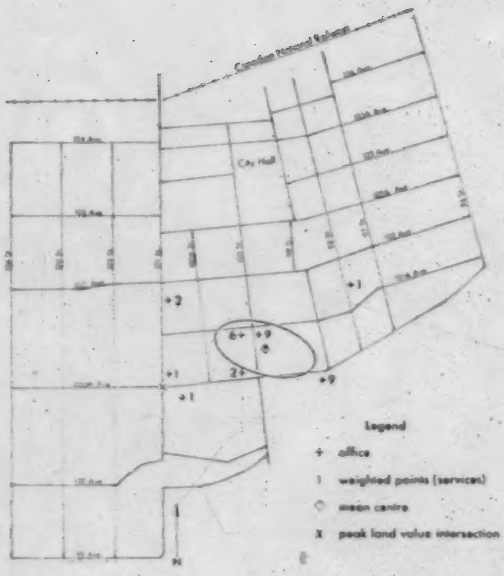

Fig. 44: Standard ellipse of services, 1940.

Fig. 45: Standard ellipse of services, 1945.

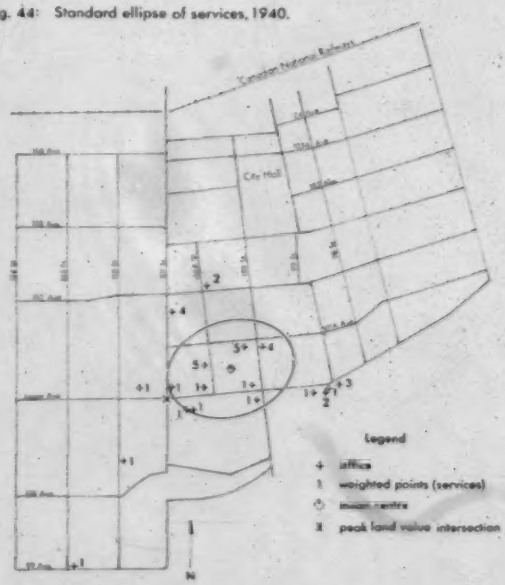

Fig. 46: Standard ellipse of services, 1950.

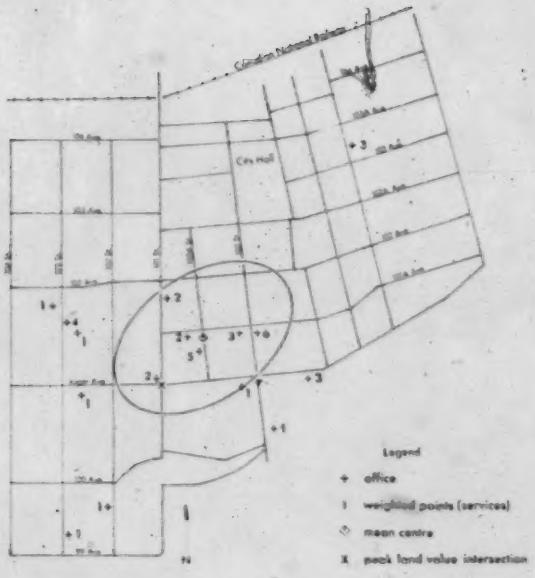

Fig. 47: Standard ellipse of services, 1955.

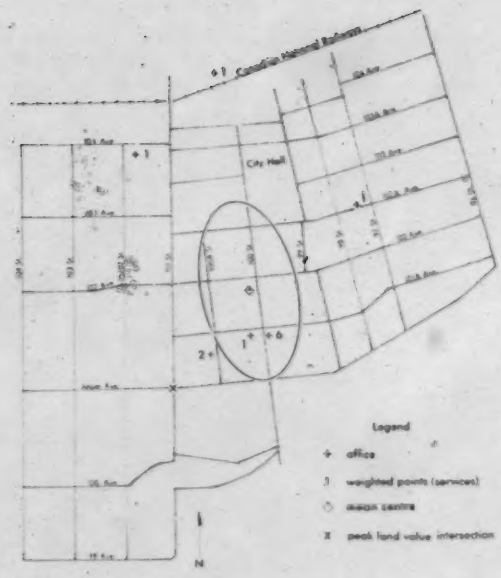

Fig. 48: Standard ellipse of services (northeast sector), 1960.

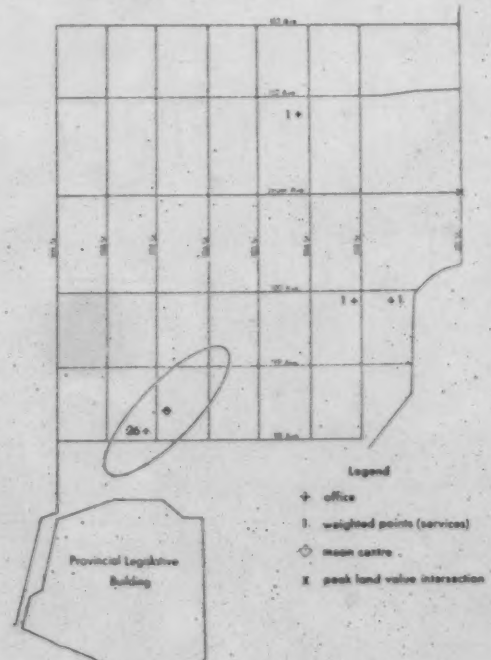

Fig. 49: Standard ellipse of services (southwest sector), 1960.

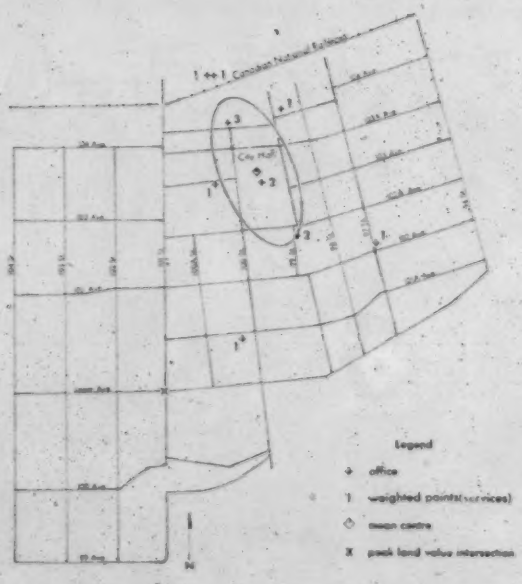

Fig. 50: Standard ellipse of services (northeast sector), 1970.

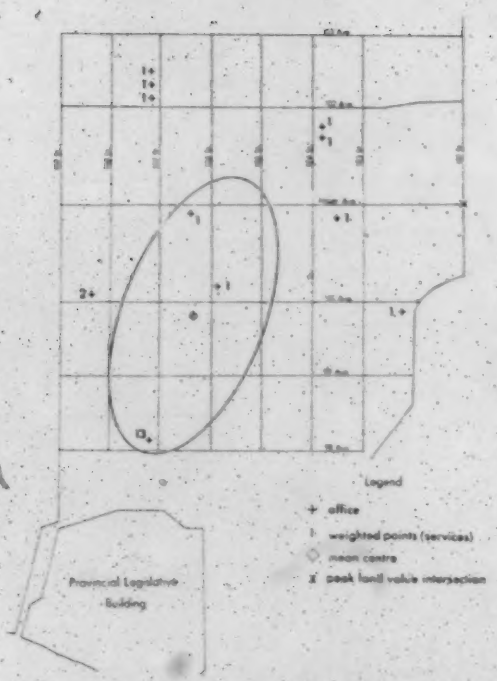

Fig. 51: Standard ellipse of services (southwest sector), 1970.

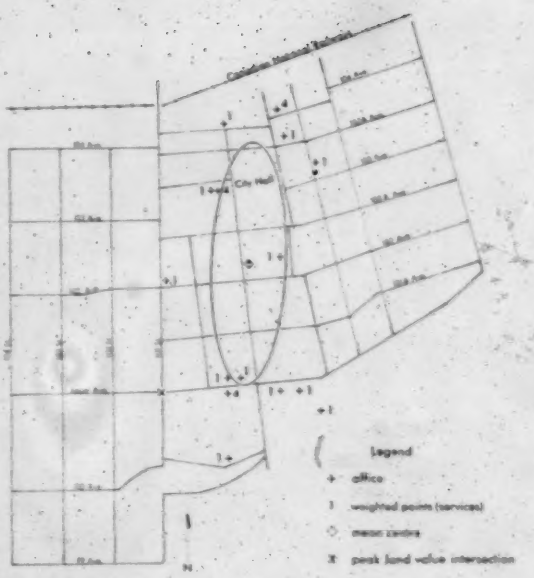

Fig. 52: Standard ellipse of services (northeast sector), 1975.

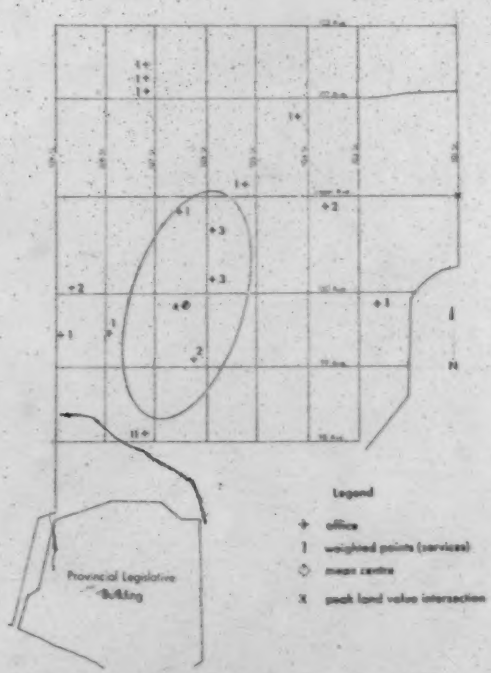

Fig. 53: Standard ellipse of services (southwest sector), 1975.

The coefficient of circularity, a measure of the "out-of-roundness" of a distribution, provides evidence that services are oriented along the major carriers of public transit in the central area of Edmonton. The distribution of services has managed to retain a fairly strong linear component throughout most of the study period. Linearity in the distribution of services was pronounced in 1930, and in the northeast sector in 1960 and 1975; but, on average, the values are slightly below the .500 value for many time periods (TABLE XVII).

On the other hand, the distribution of federal offices has tended to become circular, in particualr after 1950 (TABLE XVII). To some extent, differences between the degree of linearity in the two distributions can be attributed to the procedure for allocating services to offices. Whereas the office selection process is related to cost constraints, the allocation of services appears to be based on some consideration of their location requirements. That is, most federal services need to be located near major arterial roadways and excellent bus service. Nevertheless, offices are selected on the basis of availability and cost, and the allocative mechanism is more an afterthought than a conscious effort to acquire or to rent facilities which optimize some specific locational needs of services.

The orientation of federal offices and services corresponds with the direction of development of Edmonton's CBD and the principal areas of relocation of low face-to-face contact services, the general office sector, and the provincial and municipal governments. Specifically,

TABLE XVII

COEFFICIENT OF CIRCULARITY OF FEDERAL OFFICES AND SERVICES, 1915-1975

Year	Coefficient of Circularity (1 = circle; 0 = straight line)	
	Offices	Services
1915	.332	.328
1920	.511	.460
1925	.563	.476
1930	.360	.272
1935	.605	.696
1940	.536	.493
1945	.373	.428
1950	.601	.728
1955	.623	.638
1960 (northeast sector)	.642	.328
1960 (southwest sector)		.534
1965	.710	-
1970 (northeast sector)	.501	.467
1970 (southwest sector)	.881	.494
1975 (northeast sector)	.362	.314
1975 (southwest sector)	.736	.488

federal offices have migrated north from Jasper Avenue towards the focus of the municipal government, southwest towards the Provincial Legislative Building, and west along Jasper Avenue into the general office sector. The distribution of offices has become more circular, but this has not greatly influenced the linear pattern of services. On the other hand, the migration of offices from the CBD to the frame has influenced the orientation of services. In the southwest sector, services are distributed linearly, but perpendicular to Jasper Avenue. Consequently, there are substantial differences in access to public transit along the major axis of services.

THE SPATIAL EFFECTS OF THE LOCATION-RELOCATION PROCESS

The spatial organization of federal offices and services in Edmonton's central area underwent considerable change after 1945. The present pattern exhibits less concentration, uniformity and linearity than formerly. First offices, and then services have been displaced from the central business district. The direction and timing of this movement closely follows the major development phases of Edmonton's central area after 1945.

As well, federal offices and services locate and relocate in accordance with a regular, systematic process which operates independently from spatial change in the central area. When pressure on existing federal office space reaches some critical level, office development is rapid. Usually, this occurs as leased space in the

beginning and terminates with the construction of a single, multi-departmental complex. The former phase results in a proliferation of the number of offices. The construction phase is characterized by declining office numbers as services give up leased space and move into a government-owned complex. In the second phase, the relocation of services takes place over a short time, whereas relocation into rented space tends to be a continuous process.

Federal buildings are invariably located in the frame, but near the central business district. On the other hand, leased accommodation is most abundant within and adjacent to the central business district. Since the Government of Canada relies on the private sector for much of its office space, but also constructs its own, fluctuations in the proportion of federal services found in the CBD will occur periodically. When high percentages of federal offices and services are found in the CBD, a program of leasing is in effect. The construction of a large complex invariably signals a decline in the proportion of offices and services in the CBD.

The predilection of the federal government to maintain as few central area offices as possible initiates a relocation process with definite spatial properties. The main component in this process is the large government-owned complex which functions as a demand generator for office space. That is, much of the demand for leased office space originates from the internal growth of departments located in the main federal building. Thus, the main government structure can

be viewed as the point from which relocation into leased space is initiated. The Edmonton Central Post Office (100 Street - 101 A Avenue) and the Federal Building (9820 - 107 Street) have functioned as demand generators.

Until 1940, the Edmonton Central Post Office contained more services than any other federal facility, and it was the structure originally occupied by most new departments. Often, as services expanded in size and function, they moved from the Post Office into leased space nearby.

At least two reasons can be advanced to explain why services relocate within short distances of the demand generator. First, a large share of the supply of rentable office space is areally associated with the location of government services. Although it is not possible at present to state precisely whether this association is mainly the result of federal services having moved into the same area as the general office sector or whether the general office sector develops in the vicinity of government, both tend to occupy an identical area. In fact, the data for Edmonton suggest that the two phenomena are not discrete. That is, federal services constitute one function within the entire range of functions characteristic of the general office sector.

Second, when a department relocates, some of its branches may remain in the original office. Moves will be short, therefore, to maintain close contact with other services in the same department.

The vacant space created by relocation from the Edmonton Central

Post Office, and later the Federal Building, was taken up either by newly formed services or by existing services which moved from unsatisfactory accommodation. As the process continued, and services moved into larger, leased offices nearby, the ratio of services housed within the demand generator to services which occupied rented space declined. As TABLE XVIII clearly shows, the ratio of services in the post office to federal services in all other central area offices declined markedly after 1940. The period 1940-1955 was characterized by rapid office growth in Edmonton's central area.

The same process operated after the Federal Building was opened in 1958. The ratio of services in the Federal Building to all other federal services in the central area rose quickly between 1960 and 1965, but dropped rapidly during the next ten years (TABLE XVIII). Most services which left the Federal Building as the need for space increased, moved into leased office nearby. In fact, five out of the eight departments which departed after 1965 leased accommodation either for some or for all of their services within 1400 feet (426 metres) of the Federal Building.

Given the similarity between the ratio for services in the Edmonton Central Post Office in 1955 prior to its closure and the ratio for services in the Federal Building in 1975 prior to the proposed construction of the federal complex near the Civic Centre, it is likely that the decision to construct or purchase large federal complexes is related to the size of the ratio. As the proportion of all central area federal services housed within the demand generator decreases, the

TABLE XVIII

RATIO OF SERVICES IN THE DEMAND GENERATOR TO OTHER FEDERAL SERVICES IN THE CENTRAL AREA

	Ratio (demand generator: other federal offices)	
Year	Post Office	Federal Building
1915	1:1.60	-
1920	1:2.16	-
1925	1:2.00	-
1930	1:2.25	-
1935	1:1.60	-
1940	1:2.44	-
1945	1:5.83	-
1950	1:8.25	-
1955	1:5.66	-
1960	-	1:0.57
1965	-	1:0.33
1970	-	1:1.84
1975	-	1:5.45

amount of leased space increases. When the proportion of all federal leased space relative to the space occupied in the demand generator approaches some critical level, there is a strong possibility that a decision to acquire a large, multi-departmental complex will be made.

No attempt is made here to posit a cause and effect relationship; but there is a strong correlation between the proportion of federal office space which is leased and owned and the decision to acquire large structures.

Whereas the dynamics of the office development process determine then tenure and quantity of federal office, spatial processes govern the size and shape of the federal service distribution. It was mentioned earlier that when services move from leased or government-owned space into leased space, the moves tend to be short. On the other hand, relocation to a government-owned structure occurs over greater distances, because the site chosen for the facility is usually in the frame where land costs are relatively low and space is available.

The distribution of federal services is influenced by three general characteristics of the central business district. First, the size of the central business district has an effect on the concentration of services. When the CBD is small, federal services tend to cluster in the city centre. Competition for central sites is not severe, and the activities with which federal services interact are located in the same area. As the CBD expands, competition for sites increases. Consequently, land values rise and many governmental activities, unable to compete with the private sector for prime office sites, are transferred to more spacious, less costly sites adjacent to the CBD. Since land values in the frame are generally about five per cent of those around the peak land value intersection,[6] and development is not nearly as intensive

[6] M. Yeates and B. Garner, The North American City, New York: Harper & Row, 1971, p. 345.

as in the CBD, a wider selection of sites is available. The result of relocation to the frame is a less agglomerated pattern of governmental activities.

Second, federal services move in the direction of growth of the central area functions upon which they depend. In Edmonton, for example, the location of Federal Court of Canada is constrained by the location of the provincial Law Courts Building; the Atmospheric Environment Service, Environment Canada, has most of its business contacts in the CBD. Most important, federal services will move in the direction of growth of the general office sector, because of the need for rented space. Another important factor is the location of municipal and provincial functions. Although few federal services have frequent and close contact with provincial or municipal functions, it is a general rule that they agglomerate. Unless interrelated activities, the general office sector, and the other two levels of government all move in the same direction, the distribution of federal services will tend to be multinodal and dispersed.

A HISTORICAL MODEL OF SPATIAL CHANGE IN THE DISTRIBUTION OF FEDERAL OFFICES AND SERVICES

The spatial processes which regulate the distribution of federal services can be described in summary form as a multi-stage model. The model has three general states designated as t_1, t_2 and t_3, each having a distinct set of spatial properties. The strength of the evidence

suggests that the properties, concentration, areal association, and relative location within the central area are attributes of the federal service system in large cities. The variables, orientation, number of federal service clusters, and time required to complete the three stage cycle, are characteristic of a particular federal service system.

Certain assumptions are implicit in the model. Specifically, the demand for office space is continuous, the CBD is extending its outer limits, and the principal focus of federal office construction takes place in the general office sector. Finally, the description covers only those spatial properties which have been identified and discussed in this study. It is likely that other factors influence the spatial properties of federal offices and services. Thus, the model is incomplete, and offers a partial account of the transformation of the federal service locational system within the central area of cities.

The general spatial organization of each state of the system is presented in Figure 54. During the first stage, t_1, leased offices are grouped in the vicinity of the main federal structure, the demand generator. Additional space needs are satisfied by the general office sector which has a specific directional bias. Offices and services are uniformly distributed throughout the CBD, but they are clustered within the central area. As TABLE XIX indicates, the proportion of all central area offices and services found in the CBD is high, and the ratio of federal services in the demand generator to services in all other central area facilities is large, but decreasing.

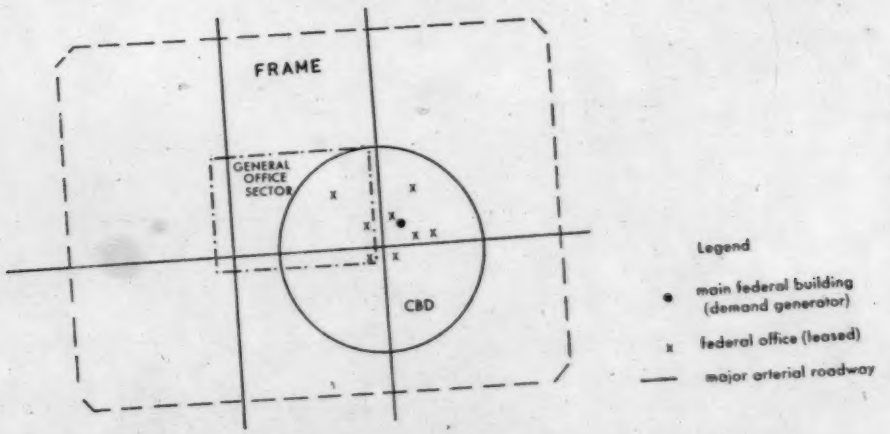

Fig. 54(a): t_1

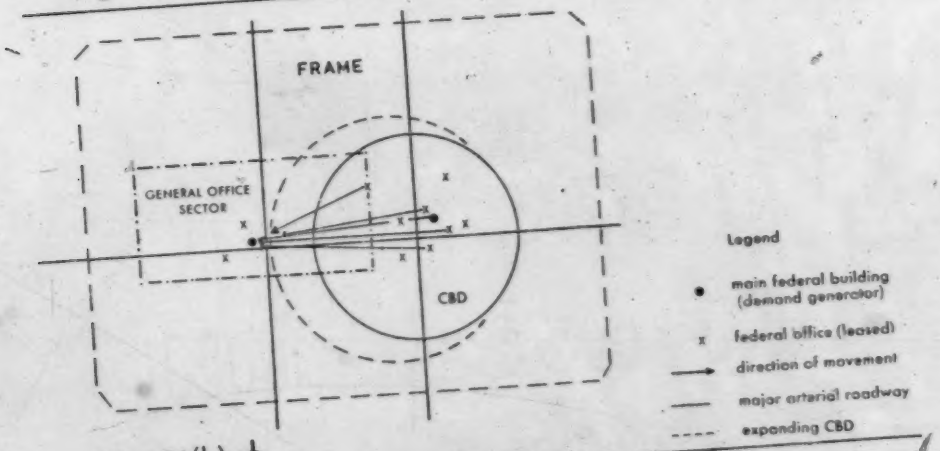

Fig. 54(b): t_2

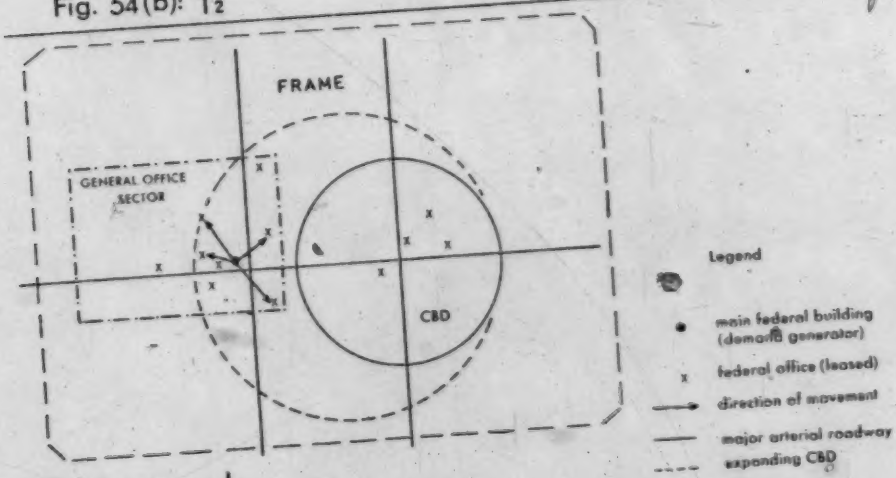

Fig. 54(c): t_3

Fig. 54: A model of spatial change in the distribution of federal offices within the Central Area.

TABLE XIX

SPATIAL PROPERTIES OF THE GENERAL STATES OF FEDERAL OFFICE DEVELOPMENT IN THE CENTRAL AREA

State	Distributional Qualities		Concentration & Nodal Development		Service Ratio (demand generator; other federal offices)	Acquisition of Leased space	Principal Area of Office Development		Length of Major Axis	Length of Moves	Proportion of offices in the CBD
	CBD	Central Area	Area of Ellipse	Nodes			Leased	Owned			
t_1	uniform	clustered	increasing	compact; single-focus	decreasing	high	CBD	-	increasing	short; within CBD	high
t_2	random	dispersed	decreasing	multi-nodal	increasing	low	frame	frame	decreasing (per node)	long; from the CBD to the frame	low
t_3	uniform	dispersed	increasing	multi-nodal	decreasing	increasing	CBD	-	increasing (per node)	short; mainly into the CBD	increasing

As the second stage, t_2, approaches, most services will be housed in rented space. This locational state precedes the decision to acquire a larger demand generator. The second stage, t_2 is a description of the spatial system from the time when the new complex is opened until most existing services stop moving from leased space into the new demand generator. During t_2, a large share of existing services move from the CBD into the demand generator which is invariably located within the frame, and in this instance, is part of the general office sector (Figure 54 b). The state of the locational system during t_2 is characterized by lengthy moves from the CBD to the frame, a high proportion of federal offices and services in the frame and increasing randomness in the distribution of offices (TABLE XIX). Also, the federal government rents little leased space, because most services can be accommodated within the demand generator. The overall distribution of offices is dispersed, but multi-nodal clusters of services are characteristic of the federal locational system in t_2.

When the demand generator is unable to cope with the space requirements of new and existing services, the federal government obtains more leased space (Figure 54 c). During t_3, offices tend to become more uniformly distributed throughout the CBD, and more concentrated within the entire central area as more space is rented from the supply of offices available in the CBD. At the same time, the CBD is growing. As it extends its outer limits the demand generator and other leased offices which were formerly in the frame become

included within the central business district. Thus, the proportion of federal offices and services within the CBD will increase. The multi-nodal patterns which developed during t_2 is present in t_3; but the acquisition of leased space in the latter stage increases the concentration of offices around each node (TABLE XIX). As the number of leased offices rises, the distribution of offices within the CBD will tend towards uniformity. It is unlikely that the pattern will become as regular as in t_1, however. The multi-nodal development inhibits the formation of a completely uniform arrangement of offices within the CBD and a clustered pattern within the central area.

On the basis of the evidence presented in this study, it is likely that the spatial processes described in accordance with the situation depicted in t_3 will eventually produce many of the spatial properties characteristic of t_1 (TABLE XIX). The main difference is in the number of office clusters which develop. The single-focus spatial organization of offices in t_1 is likely characteristic of small central business districts and with the CBD of larger Canadian cities before extensive intra-urban development occurred. In larger central business districts, multi-nodal distributions might be expected to occur more frequently, given differences in land values between the core and the frame, intense competition between certain activities for prime sites, and the functional and areal associations which federal services have with the public and private sectors.

Finally, the data for Edmonton indicate that the spatial organization of federal offices and services within the central area

of cities may be the product of a cyclical process. Two major spatial states resulting from this process are represented by the stages, t_1, and t_2, in Figure 54. The main components of the process are (1) the manner in which the federal government acquires and rents office space for its services, and (2) the changing pattern of land uses and activities in the central area.

Chapter VI

ACCESSIBILITY TO CONSUMER-ORIENTED SERVICES IN THE CENTRAL AREA

Having been forced from the vicinity of the Edmonton Central Post Office and the peak land value intersection after 1945, federal services took up office space in the frame. Although relatively more parking space and cheaper site and leasing costs are available in the frame, bus service is not as good as in the CBD. Since accessibility for federal client and employee bus users is the main location requirement for most central area consumer-oriented services, it might be expected that office movement from the CBD would increase the time and distance which clients spend to reach an office. The purpose of this chapter is to evaluate the accessibility inherent in the location of consumer-oriented services within the frame, and to discuss the relocation of services within the context of the locational criteria identified by federal decision-makers.

Accessibility can be defined as the opportunities inherent in any location which permit ease of movement from that location to all other locations. The most common component in operational definitions of accessibility is distance. In this study, Edmonton is treated as an isotropic surface such that the location which minimizes the linear distance separating a facility from its clients is the optimum. This definition is limited because it fails to recognize social and economic

differences among clients' abilities to use the service, differences in the mode of transport used by clients, and abberrations in Edmonton's transportation surface. From the viewpoint of location theory and locational planning, the concept of accessibility employed in this study is relevant; but to the extent that it does not completely reflect reality, its application is restricted to a specific purpose. The objective in this chapter is to devise a quantitative index for measuring the accessibility inherent in federal services within the frame. The index, used in conjunction with auxiliary information such as the location of central area bus routes, represents and improvement over 'rule of thumb' procedures for evaluating alternative locations, but falls short of being a definitve technique in locationsl planning.

An ancillary objective is to assess the performance of the location-allocation model used to compute accessibility to actual and optimal facility locations. Although this study focuses on the location requirements and spatial organization of federal consumer-oriented services, it would be negligent not to recognize the intersection of geographic explanation and locational planning, and the contradictions intrinsic in prevailing concepts of spatial equity for public facility systems.

METHODOLOGY

Accessibility to federal consumer-oriented services within Edmonton's central area will be evaluated with reference to the distance separating federal services with different levels of face-to-face contact

from the focus of converging bus lines. The arrangement of services within the central area is one indicator of the extent to which management attitudes are given expression in the actual location of services.

The second phase of the analysis considers the accessibility inherent in the location of one group of consumer-oriented services, those provided by Unemployment Insurance Commission. The distance costs incurred at the actual locations are measured as a percentage of the distance costs at the optimal locations. The model used in this study is a heuristic, but its objective function and constraints are similar to the linear programming prototype:[1]

$$\text{minimize} \quad Z = \sum_{i=1}^{m} \sum_{j=1}^{n} d_{ij} r_j \lambda_{ij} \tag{1}$$

$$\text{subject to} \quad \sum_{i=1}^{n} \lambda_{ij} = 1 \qquad (j = 1,2,\ldots,n) \tag{2}$$

$$\sum_{i=1}^{n} \lambda_{ij} = m \tag{3}$$

Whenever $\lambda_{ij} = 1$, region j is assigned to a central facility in i, and the constraint $\lambda_{ij} = m$ ensures that exactly m central facilities are located. The additional constraints

$$\lambda_{ii} - \lambda_{ij} \geq 0 \qquad \begin{matrix}(j = 1,2,\ldots,n) \\ (j = 1,2,\ldots,n) \\ (i \neq j)\end{matrix} \tag{4}$$

and

$$\lambda_{ij} \geq 0 \tag{5}$$

ensure that a region j may not be assigned to any i which does not contain

[1] A.J. Scott, "Location-Allocation Systems: A Review," Geographical Analysis, Vol. II, No. 2, 1970, p. 101.

a central facility ($\lambda_{ij}=0$).

The Choice of UIC Services

The services of Unemployment Insurance Commission are not subject to some of the limitations intrinsic in simple location-allocation models. A number of reasons related to the nature of UIC services make this department susceptible to analysis by straightforward location-allocation models.

First, accessibility to clients is an important location requirement for UIC. Sixty per cent of UIC clients presently make at least one visit to an office, if they reside in or near the City of Edmonton. Recently, UIC initiated a policy in which all clients are urged to visit the office to receive a full explanation of their rights and obligations.[2]

Second, most clients travel to an office by bus.[3] This reduces, but does not eliminate, the seriousness of one shortcoming in the model, its inability to take into account differences among users' abilities to travel to an office.

Third, the common economic circumstances of UIC clients ensures that no blatant economic disparities exist among the users' need for the service. The objective function of the model cannot accommodate complex

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[2]Interview with Mr. Ken Oswald, Director, Planning and Evaluation, Unemployment Insurance Commission, Prairies Region, in Winnipeg, Manitoba, September 9, 1975.

[3]Interview with Mr. H. Verheijen, District Manager, and Mr. J. Nicol, Officer-in-Charge, Unemployment Insurance Commission, in Edmonton, June 30, 1975.

socio-economic variables.

Also, UIC services are used infrequently by individual clients. Thus, it is likely that clients will make a single-purpose trip, thereby eliminating the need for constraints which would cover forms of consumer behaviour such as multi-purpose trips.

Finally, it was stated earlier that public service systems should be provided in an equitable manner. That is, the locational system should minimize "the total social disutility inherent in the provision of ...[the] service."[4] One geographic viewpoint maintains that a point in space has attributes of equity as well as efficiency. Hence, social disutility can be reduced by minimizing the effort required to overcome space.

To date, most of the research which has employed this concept of equity is aimed at solving location-allocation problems for health care and hospital services. The theoretical rationale of these studies is that use and effectiveness of the services increase if spatial equity is optimized.[5] The effect of the distance variable on effectiveness has

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[4]John G. Symons, "Some Comments on Equity and Efficency," Antipode, Vol. 3, No. 1, 1971, p. 58.

[5]See, for example, W.J. Abernathy and J.C. Hershey, "A Spatial-Allocation Model for Regional Health Services Planning," Operations Research, Vol. 20, No. 3, 1972, pp. 629-641; Jerry B. Schneider and John G. Symons, Regional Health Facility Systems Planning: An Access Opportunity Approach. Regional Science Research Institute Discussion Paper Series, No. 48, July, 1971; and Nancy Veeder, "Health Services Utilization Models for Human Services Planning," Journal, American Institute of Planners, Vol. 41, No. 2, 1975, pp. 101-109.

been questioned, however. Smith, for example, has found that distance from mental health care facilities has a negligible effect on recidivism, although use of the service is increased.[6]

There is no empirical evidence to show that a more equitable locational system of UIC offices would increase either the use or the effectiveness of unemployment insurance services. Intuitively, it can be argued that certain advantages would be gained by increasing equity in the system.

UIC provides three services for which clients might travel to an office. The office handles public enquiries concerning application for UIC benefits, provides assistance in completing applications and an explanation of the client's rights and obligations, and conducts follow-up interviews to ensure ongoing eligibility for UIC benefits. According to the Edmonton District Manager for UIC, clients are often confused as to their responsibilities and privileges because they do not receive the information personally, at an office.[7] At present, only 20 per cent of UIC clients served by the Edmonton offices have their rights explained to them at an office. Indeed, many clients have become frustrated and may turn to a third party to hear their complaints. The local daily, for example, contains numerous references in its "SOS" column to UIC clients with problems that could have been cleared up by a visit to an

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[6] C.J. Smith, "Distance and the Location of Mental Health Facilities: A Divergent Viewpoint," Economic Geography, Vol. 52, No. 2, 1976, pp. 181-190.

[7] See footnote 3, page 141.

Unemployment Insurance Commission office.[8]

A major problem is deciding equity for whom? In principle, spatial equity should be provided for the individual. Since it is not possible to provide a facility for each person, a practical solution is to maximize equity for groups of clients who use an existing facility. The spatial expression of equity for groups of clients is areal, as opposed to that of the individual, a point in space. In this study, the objective is to increase equity for hard core unemployment areas which, by definition, persistently contain large concentrations of unemployed persons. It was not possible within the time available to gather data with which to delimit hard core areas of unemployment in Edmonton; however, the approximate limits were determined by mapping the distribution of UIC clients for a single point in time. Hard core unemployment will tend to remain in the same area over fairly long periods of time. It is possible, therefore, to recognize those areas which suffer the most unemployment by mapping the location of clients at one time period.

A basic underlying principle is that areas of hard core unemployment have greater need of UIC services. If clients from these areas are more willing to travel to a nearby office, there is a greater chance that they will fully understand their rights and obligations under the Unemployment Insurance Commission Act.

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[8] Edmonton Journal. "SOS", February 7, 26; March 20; and May 6, 10, 1976.

In the absence of economic data which could be used to establish a quantitative expression of inequity among areas containing UIC clients, relative inequity is calculated simply as the number of clients located in each cell of the square net population map forming the input data for the location-allocation program. Since the optimal location depends on the population weights assigned to each cell, equity is increased for hard core unemployment areas. The solution therefore discriminates against low unemployment areas, because they will be farther from the facility.

THE SPATIAL ORGANIZATION OF CONSUMER-ORIENTED SERVICES

Over 80 per cent of federal consumer-oriented services have office accommodation in the central area of Edmonton. Although Post Office, Unemployment Insurance and Canada Manpower Centre operate branch offices in other parts of the city, only four departments, Royal Canadian Mounted Police, National Parole Service, Penitentiary Service and Canadian Grain Commission do not operate from the central area as defined in this study. The location of services corresponds with the locational attitudes of management. Federal decision-makers have definite, though weakly articulated, preferences for the area of the city where they feel their services should be located. Since the traditional locus of government services is the central area of cities, historical precedent is perhaps a key reason why the federal decision-makers believe that the central area is the best location for their services.

In general, decision-makers are satisfied with their present office locations. When asked to assess the extent to which present locations meet the locational criteria they feel are important, 45.2 per cent responded "very closely", and 22.6 per cent stated "closely". The remainder, 32.2 per cent, expressed some dissatisfaction with the location of their services. The most common grievance listed relates to some aspect of transportation. The department of Agriculture (9820 - 107 Street) is the main source of complaint. One problem encountered by Health of Animals Branch is reaching clients and returning to the office:

> Most of the travelling is outside the city limits. Returning from travel duties, it is time-consuming to reach the office at rush hours. Most of our contacts are with livestock owners and...they would find it easier to reach our office [if it were located] in a fringe area [the urban fringe]....

Other departments, for example, Post Office (9828 - 104 Avenue) have parking problems. Most departments mentioned the poor location of offices in relation to bus routes. The respondent for Veterans Affairs, Welfare Services Branch (9943 - 109 Street) stated: "Clients have to walk two long blocks after getting off the bus." One employee of Health and Welfare expressed dissatisfaction with the distance clients had to walk. Moreover, he felt that Edmonton Transit System had been uncooperative in scheduling bus routes near their office at 9912 - 106 Street.

Most complaints concerning the availability of transit services originate from federal departments west of 103 Street. Fourteen of the

thirty central area offices are located in this sector, and they accommodate 55 per cent of all consumer-oriented services. Figure 55 reveals that eight offices are more than one block from a thoroughfare serviced by five or more bus routes. The best bus service is provided within the area bounded by 102 and 97 Streets, and Jasper and 104 Avenues. The bus routes which traverse this area draw customers from all areas of the city. Poorer service is provided west of 103 Street, although more than six routes pass by three federal offices located on Jasper Avenue (Figure 55).

Over two-thirds (68 per cent) of federal services which require face-to-face contact with more than fifty per cent of their clients are situated within one block of high density (five or more) bus routes. Respondents complained of the bus service if their office is more than one block from high density bus routes. The length of a block, approximately 600 feet (183 metres), can be adopted as a tentative standard for optimizing accessibility to consumer-oriented services within the central area.

Services around City Hall in the northeast sector, and on Jasper Avenue, have the best transit coverage. Five of the fourteen offices east of 101 Street do not contain any high face-to-face contact services, however. Considering the relative locational disadvantages suffered by some consumer-oriented services in the southwest sector, it is not unlikely that the location requirements of services are emphasized less than the availability and cost of leased space.

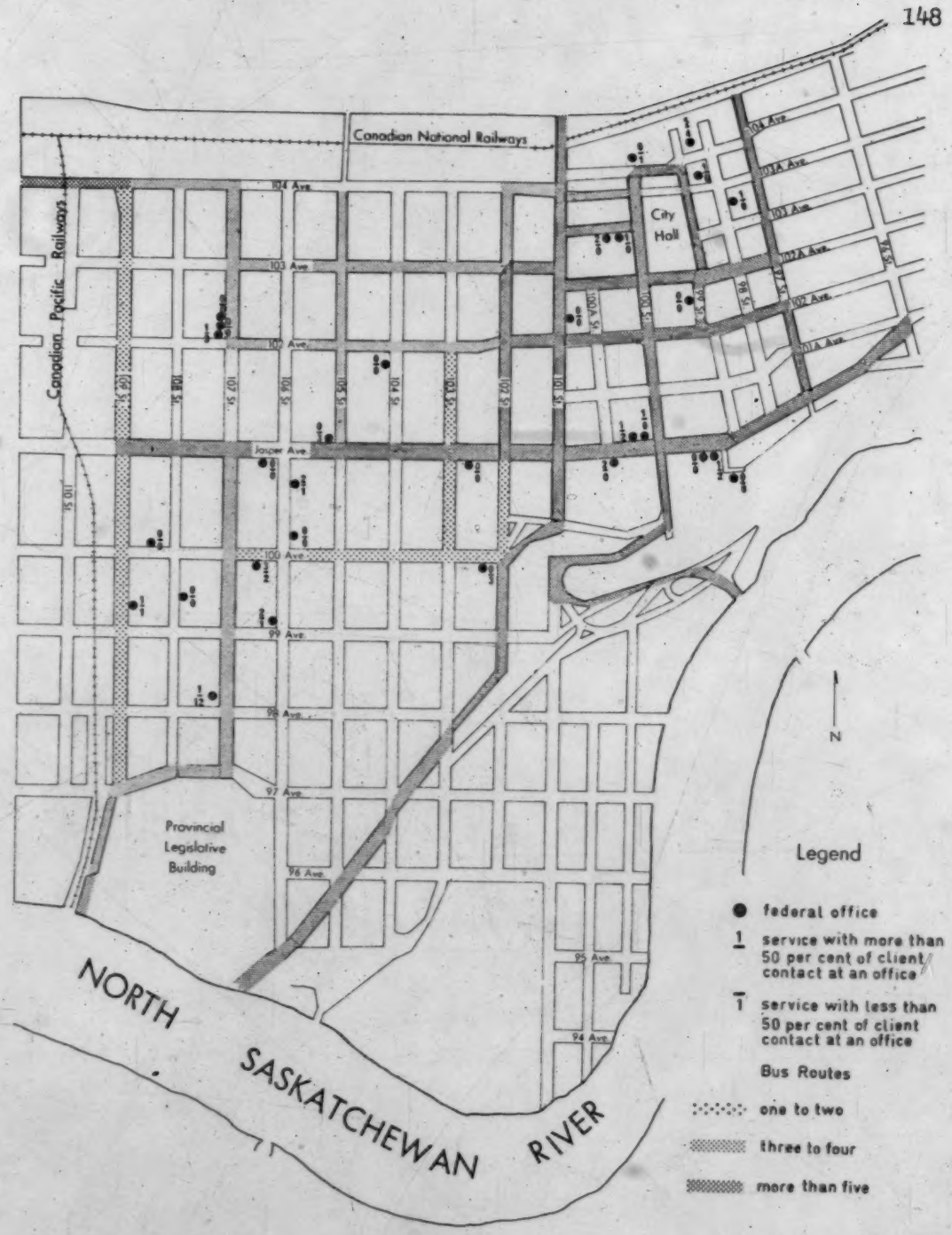

Fig. 55: Central area bus routes.

Otherwise, one would expect that federal offices which, by virtue of their location within the CBD are accessible to the public, would house more consumer-oriented services with high levels of personal contact with the public.

In contradistinction, the spatial organization of consumer-oriented services conforms, on average, to the expected pattern: services with high levels of face-to-face contact at an office are nearer to high density bus routes than are other federal services. Whereas seventeen (68.0 per cent) of the services with greater than fifty per cent of client contact occurring at an office are less than 600 feet (183 metres) from high density bus routes, twenty-two (62.8 per cent) of the low personal contact services are more than 600 feet (183 metres) from high volume bus traffic. Unfortunately, the data do not indicate whether this arrangement was a deliberate attempt by the federal government to provide accessible CBD office space to services with high levels of personal contact, or whether it is simply a chance occurrence. Given that few federal departments have fully formulated locational guidelines at the intra-urban level, and that Public Works, the realty manager for the federal government, is mainly concerned with obtaining the lowest cost office alternative and with the structural design of federal facilities,[9] it is doubtful that the spatial organization of federal services was planned.

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[9] Canada, Department of Public Works, Annual Reports, 1973 and 1974.

The only clear conclusion is that the autonomy of departments makes it difficult to derive any generalizations about the arrangement of face-to-face contact services in Edmonton's central area. Certain federal services, as a result of the functions they perform, insist upon, and may receive, office accommodation in a particular location. Canada Manpower Centre (10015-103 Avenue), for example, provides a counselling service for job placement. It needs to be near excellent bus service which is the main transport mode for its clients, many of whom are unemployed persons. The main planning guideline for some departments, according to the questionnaire findings, is the amount of office space available, not the office location. For others, office space is contingent upon the location of provincial facilities. Federal Court of Canada, for example, makes use of the Provincial Law Courts Building. In this sense, their location requirements are subsumed under the direction of provincial decision-making.

In summary, federal decision-makers prefer the central area for its inherent accessibility and because of their interrelationships with other government functions. The distribution of federal services within the central area is primarily a product of office acquisition and leasing policy, the number of services provided by each department, and the growth characteristics of the central business district. On average, decision-makers are satisfied with the present location of their services. Nevertheless, nearly one-third of consumer-oriented services do not have ready access to ubiquitous bus service. When

complaints arise, they inevitably concern the lack of bus service for clients. This suggests that services in those areas of the frame which lack public transit, and which would not be relocated to the CBD because of office acquisition and leasing policy, might be moved outside the central area, nearer to the source of their clients. At present, clients who travel by bus to an office in the frame may have to walk several blocks from the CBD or make at least one bus connection. It is likely that many non-central area sites have similar bus service, but are available at a lesser cost and are closer to the clients. Although land values towards the outer edge of the frame are generally only five to nine per cent of those at the peak land value intersection,[10] they are still greater than site costs in the inner city and the suburbs.

Besides a reduction in site costs, relocation to an area which is closer to clients reduces travel costs for employees who visit the clients' residences, and for clients who travel by auto to the office. Relocation to a non-central area would reduce the time involved for employees who presently must traverse heavy traffic in the central area to reach clients in other parts of the city, and return through the same traffic without the assurance that parking space will be available near the office.

The location of federal offices in relation to central area

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[10] Michael J. Bannon, The Evolution of the Central Area of Edmonton, Alberta, 1946-1966. (unpublished M.A. Thesis), Department of Geography, University of Alberta, 1967, Map 11.

bus routes is not a sufficient description of accessibility. To be more exacting, the location of clients should also be taken into consideration. Although most respondents stated that their clients come from all areas of the city, it is not known whether they are evenly distributed, or localized. If the locations of clients are known, the accessibility inherent in actual service locations can be evaluated.

ACCESSIBILITY TO UIC SERVICES

Unemployment Insurance Commission operates a district office at 10704 - 102 Avenue, and a branch office at 10452 - 82 Avenue. The North Saskatchewan River forms the northern boundary of the catchment area for the southside office, and the southern boundary of the northside office. Clients are drawn from throughout Edmonton, but distinct concentrations exist around and northeast of the central business district to 122 Avenue (Figure 56). Lesser concentrations occur southeast of the Edmonton Industrial Airport along a north-south axis, east of the University of Alberta along 82 Avenue, and south of 63 Avenue between 103 and 107 Streets (Figure 56).

Compared with federal services in the central business district, the services of UIC are poorly served by public transit. The central area office is near four bus routes, but these operate at peak hours only, and do not directly serve a large share of UIC clients (Figure 57). Bus users from the north and northeast must make at least one transfer or walk several blocks from the vicinity of the peak land value intersection.

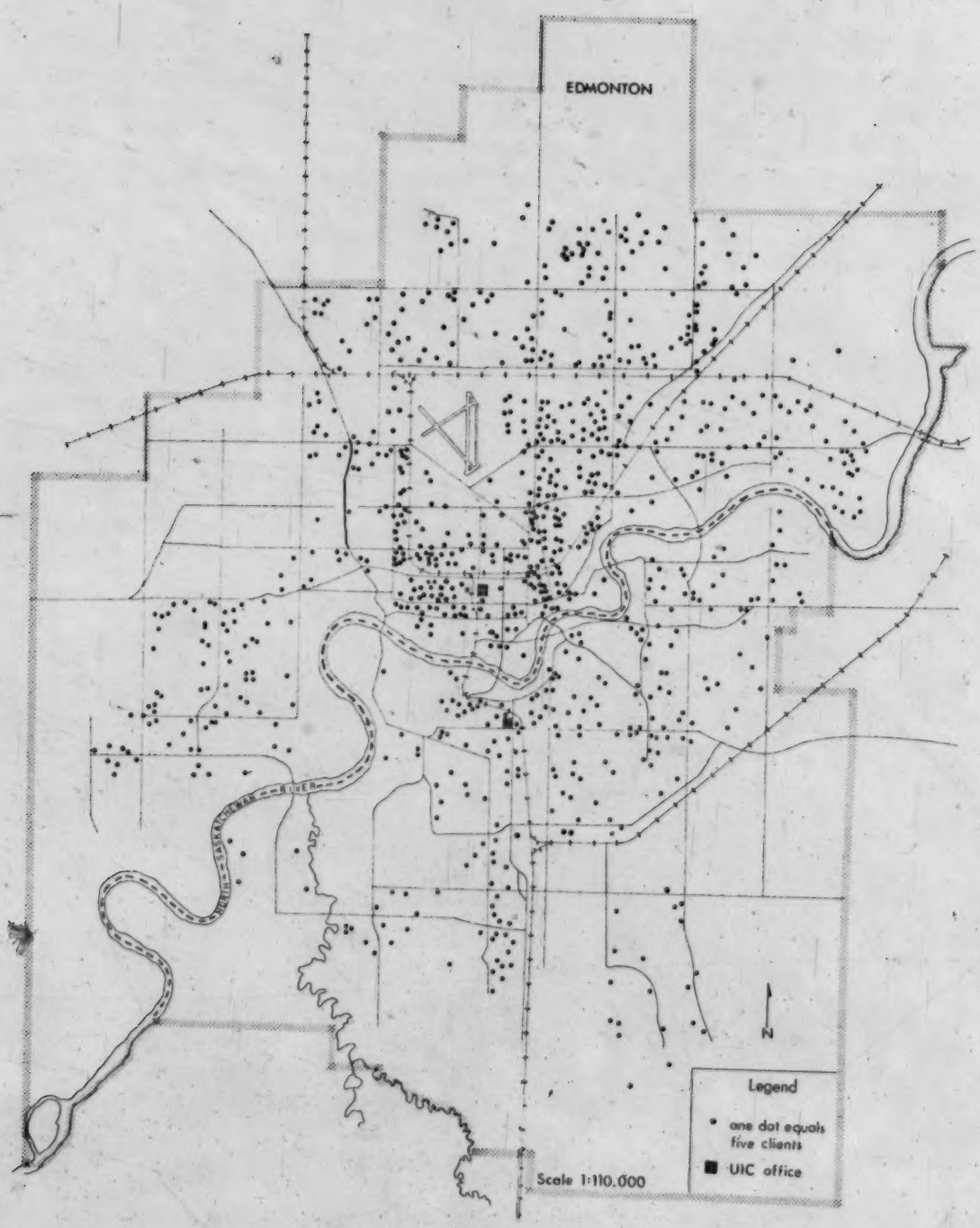

Fig. 56: Distribution of UIC Clients, December, 1975.

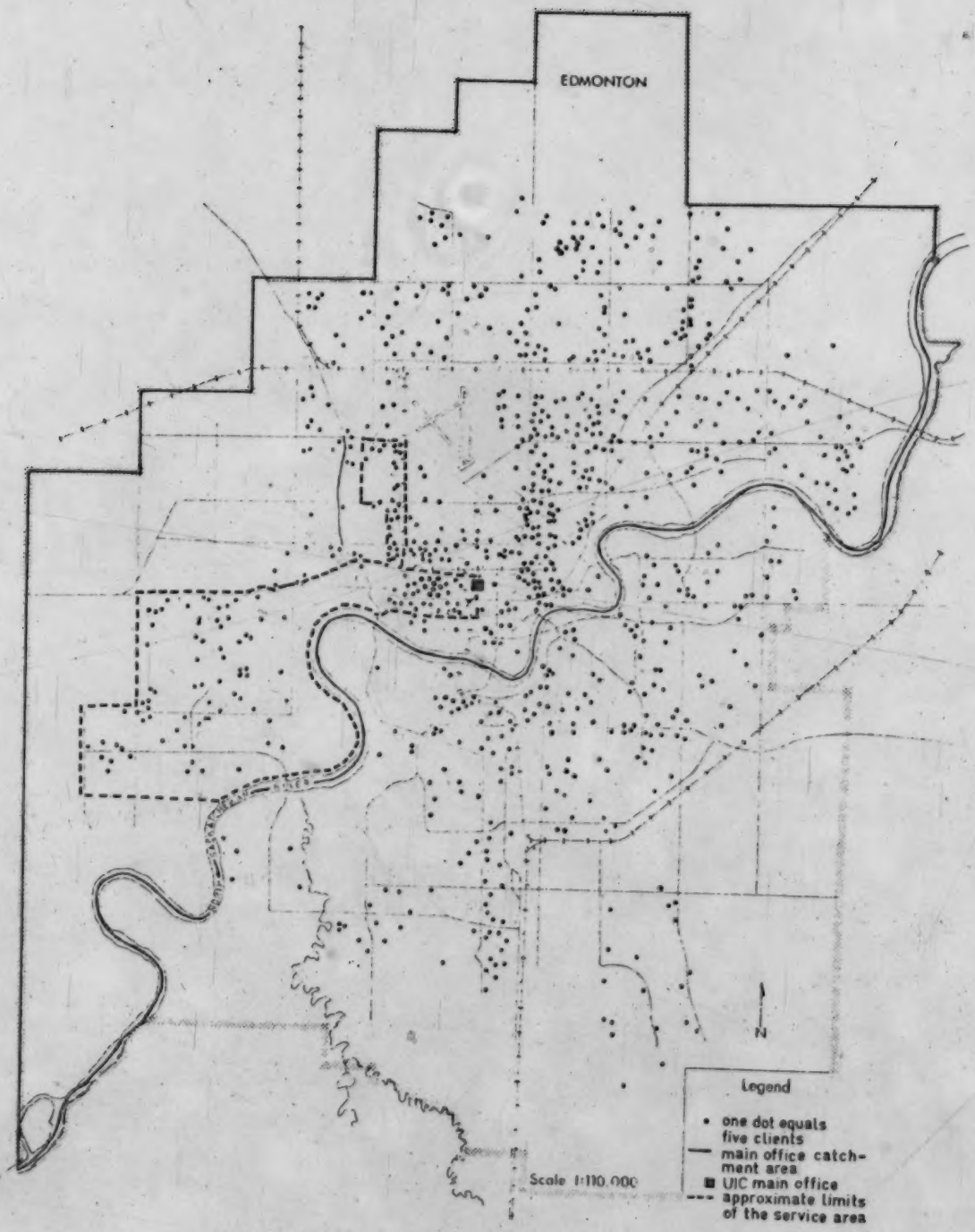

Fig. 57: Service area of bus routes which pass by the main office of UIC.

Optimal locations for the two offices reduce the total aggregate round trip distance which clients must travel. The distance saved for all clients who collected unemployment benefits on December 31, 1975 amounted to 2,035 miles (3,275 kilometres). The total aggregate distance might be less in the summer months when unemployment is lower. The percentage of unemployed residents in the hard core areas who find work in the summer would not likely be as high as in areas of low unemployment.

TABLE XX

ACCESSIBILITY INDEX FOR UIC SERVICES

Locations	Total Aggregate Linear Distance		Percent of Actual costs
	Miles	Kilometres	
Optimal*	10,015	16,118	83.0
Optimal**	10,160	16,351	84.2
Actual*	12,050	19,393	100.0
Actual**	12,050	19,393	100.0

*Both facilities are allowed to move
**Main facility is stationary

As TABLE XX shows, a 17 per cent reduction in distance costs is possible when both facilities are allowed to relocate. The optimal solution places both offices north of the North Saskatchewan River (Figure 58). The facility at 10704 - 102 Avenue has been shifted north-east to 82 Street and 122 Avenue, the northern perimeter of one hard core

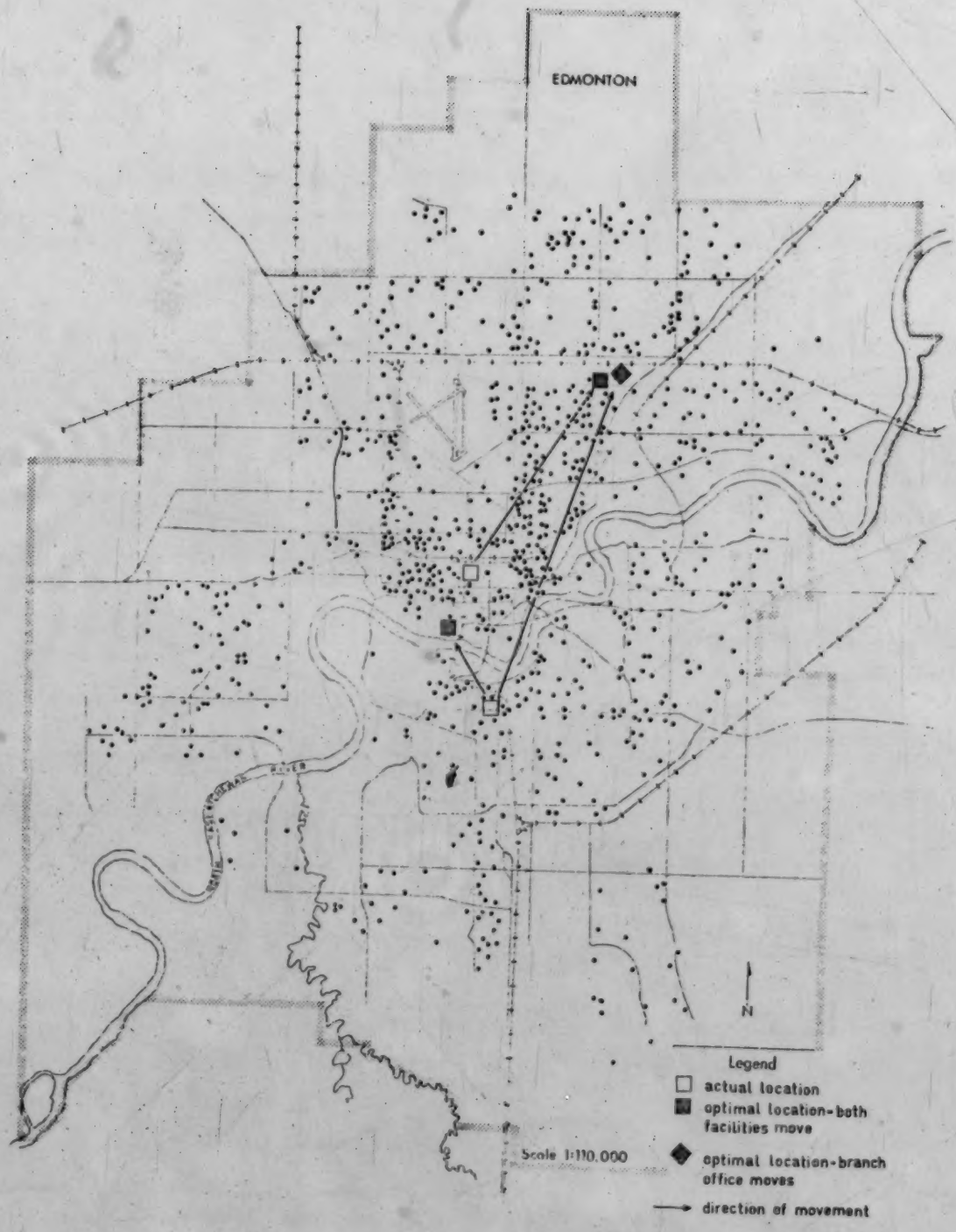

Fig.58:The optimal location of UIC offices.

unemployment area. The branch office has been moved to 114 Street and 98 Avenue, near the outer edge of the frame and southeast of the actual site of the main office.

When only the branch office is permitted to relocate, the distance costs are similar (TABLE XX). The optimal location for the branch office is three blocks east and two blocks north of the first solution (Figure 58). Although distance costs are slightly higher than when both facilities relocate, the second solution tends to confirm the efficacy of the location-allocation program.

Compared with the actual locations, the optimal locations are near good bus service. The optimal location at 82 Street and 122 Avenue is traversed by two bus routes which together serve a large portion of its catchment area (Figure 59). Most clients who are not directly served by the routes can get to the optimal location with only one transfer. Once rapid transit is operational, the optimal location will receive improved service. It appears, therefore, that the 82 Street and 122 Avenue location provides greater accessibility than the present office (10704 - 102 Avenue).

Conversely, the optimal location at 114 Street and 98 Avenue is comparatively worse off than the 82 Avenue branch office. The branch office is well served by public transit, whereas the optimal location (114 Street and 98 Avenue) is not presently served by any bus

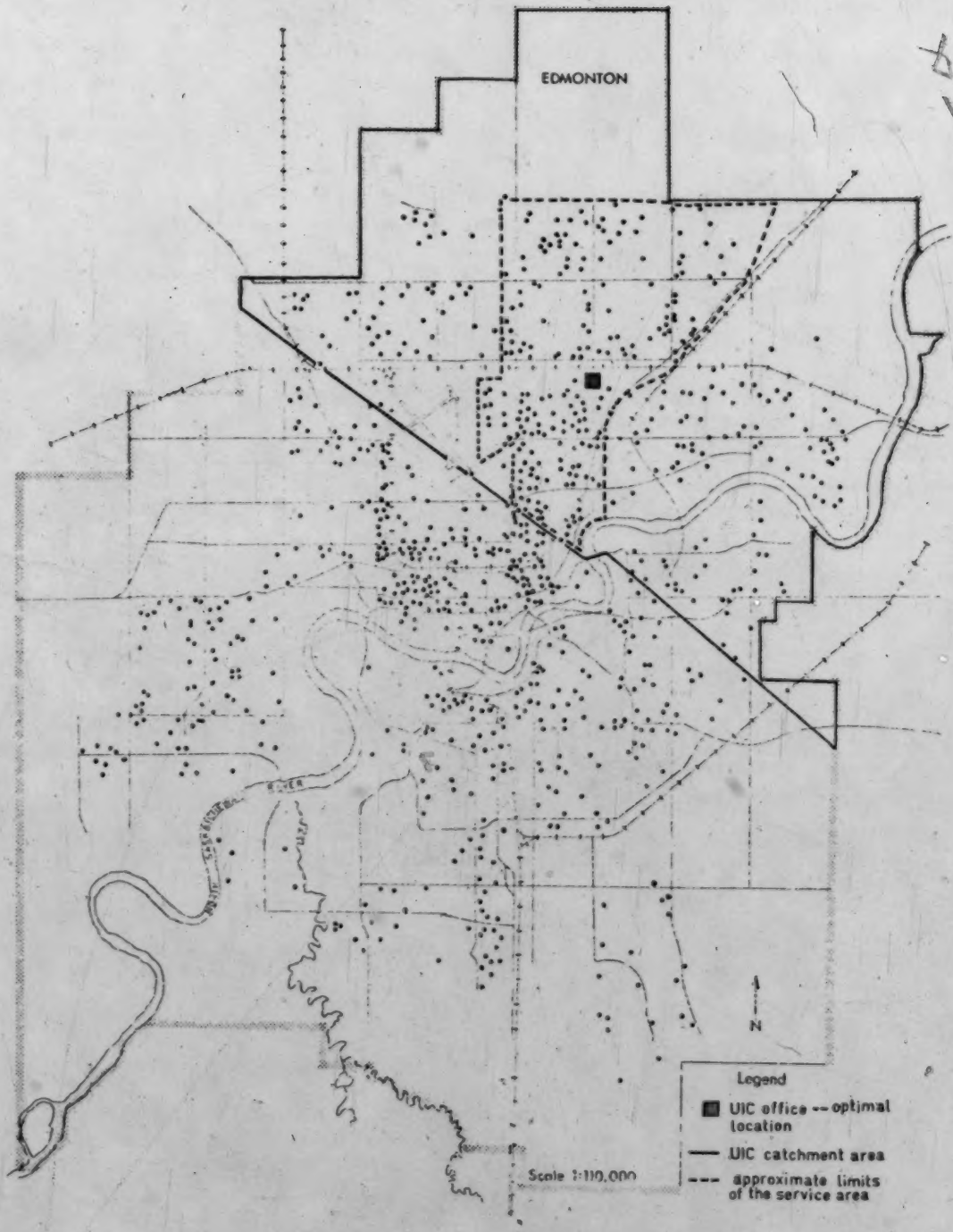

Fig. 59: Service area of bus routes which pass by the optimal location of the non-central area office.

routes. Nevertheless, if the optimal location were shifted closer to the CBD, where bus service is available there would be a net increase in accessibility.

Advantages and Disadvantages of the Location-Allocation Model

The location-allocation model used in this study serves as a tool for measuring accessibility to existing UIC facilities. As a planning device it has limited applicability.

First, the optimal solution produces an inefficient boundary marking the catchment area of each facility (Figure 58). Whereas the North Saskatchewan River forms a natural boundary, the boundary produced by the model cuts diagonally across residential districts. This would create administrative problems, since it would require some effort to decide who must travel to which facility.

Second, the catchment area of the optimal location at 98 Avenue and 114 Street is large, relative to that of the other optimal location, although it is approximately the same size as the catchment area of the present office at 10704 - 102 Avenue. A more equitable solution would require either that capacity restrictions are placed on the central area office to ensure that the maximum distance clients must travel would not be substantially different for each catchment area, or that the number of facilities is increased.

The optimal solution produces social costs which might exceed the benefits produced by locating facilities closer to hard core

unemployment areas. The location at 114 Street and 98 Avenue borders mixed residential land use ranging from single family units to high rise apartments. The location at 82 Street and 122 Avenue is a mixture of low rise residential buildings and commerical uses, surrounded by single family dwellings. It might be expected that a UIC office located semi-permanently at either location would stigmatize the adjacent residential areas. The UIC office would become a negative symbol through which the community's residents come to associate areas of low income, poverty and hardship.

The main advantage of the model is that it combines a measure of efficiency and equity for UIC services. At the same time, the lack of a distance decay function to reduce the effect of distance on unemployed persons living near the circumference of the catchment areas, and economic differences among clients abilities to use the service preclude the model's function as an applied planning tool. Fundamentally, there is little theoretical rationale to explain what factors would compose an equitable distribution of UIC offices.

CONCLUSIONS

Although federal consumer-oriented services have moved from the CBD to the frame where bus service is relatively poor, federal decision-makers are generally satisfied with their present locations. In part, their satisfaction is attributed to the arrangement of consumer-oriented services within the central area. On average, low face-to-face

contact services are farther from high volumes of bus traffic than are the high face-to-face contact services. Since the former group requires adequate parking space, which the frame provides, and the latter services are near good bus service, their main locational criterion, there are few complaints which relate to the accessibility and transportation needs of consumer-oriented services.

Decision-makers who express dissatisfaction with their present location are concerned with the lack of parking space, distance from interrelated government functions, and inferior bus service. Complaints concerning poor bus service arise when clients must walk more than one block to reach the office. Bus service is inadequate for consumer-oriented services within the frame, and in particular, for services located north or south of Jasper Avenue towards the western perimeter of the frame. Since federal policy is to lease inexpensive office space from the general office sector which is moving westward, federal offices cannot move closer to the focus of converging bus routes.

The clients of some consumer-oriented services experience difficulty in reaching the office by bus. This gives rise to the possibility that the frame is an inefficient location for offices. For UIC services, the frame is a suboptimal, but fairly accessible and equitable location, provided that a branch office is located on 82 Street and 122 Avenue, and not on 82 Avenue, the actual location.

In conclusion, the data suggest that consumer-oriented services which have been forced from the CBD maintain high levels of spatial

efficiency and accessibility to their clients; but, less expensive inner city locations could be just as efficient and accessible. Relocation to inner city areas, however, could produce negative externalities for the neighbourhoods adjacent to the facility.

Chapter VII

REVIEW AND CONCLUSIONS

To date, there have been few geographical studies on the location of federal services within the broader context of public facility system planning. This study attempted to identify the major physical location requirements of a sub-set of federal public functions, those concerned with consumer-oriented services. A second theme examined the locational trends of federal offices and services within the central area of Edmonton in an effort to determine the main factors involved in producing the present spatial organization of federal services. An ancillary objective was to evaluate the effect of spatial change on the ability of the federal service locational system to meet its principal location requirment, accessibility for clients. In this chapter, the findings of the questionnaire and central area locational analysis are reviewed. Finally, conclusions are presented and potential lines of research suggested by this study are discussed.

REVIEW OF FINDINGS

A questionnaire survey of federal decision-makers' attitudes to their locational criteria, point pattern and centrographic techniques, and map and graph analysis comprise the analytic tools used to examine federal services in Edmonton. Problems were encountered in the application of each technique, but the overall results produced some

useful information on the location of urban-based federal services.

Management Attitudes to Their Locational Criteria

The questionnaire requested federal decision-makers in Edmonton to rank a set of physical location requirements necessary for the efficient provision of their services. A series of locational needs within the general categories, area of the city, land use associations, activity associations, transportation requirements, and accessibility requirements were ranked. Then, respondents ranked the general categories. Also, respondents were asked to state why the most important of their location requirements were essential in the provision of services to their clients, and to list the locational planning guidelines used by their department.

The questionnaire analysis revealed that accessibility for clients and employees, ubiquitous bus service, parking space, and proximity to interrelated government functions are the main perceived location requirements of consumer-oriented services. Most decision-makers feel that the central area, and in particular the central business district, is the location which meets their locational needs.

Location requirements were found to vary in accordance with the amount of personal contact that takes place at an office, but few differences in location requirements exist among the three basic types of consumer-oriented services, information-oriented services, non-

information services, and services providing tangible goods. Services which meet more than fifty per cent of their clients at the office generally prefer the CBD, and are mainly concerned with accessibility for their clients and proximity to other federal departments. Low face-to-face contact services exhibit greater variability in the choice of a location. These services are less dependent upon proximity to other government functions and need adequate parking space for crown-owned, employee, and client parking. Parking space is important since employees frequently visit their clients outside the office.

Decision-makers revealed definite, but weakly developed attitudes to their location requirements. In part this can be attributed to the lack of comprehensive, fully formulated location principles for intra-urban site selection. As well, a more detailed questionnaire might have elicited fuller answers from the respondents.

The Location of Federal Offices and Services

The nearest neighbour statistic (R) and the centrographic measures, mean centre, standard radius, standard distance, and distance of displacement provided a quantitative description of the spatial change undergone by federal services in Edmonton's central area. Problems were encountered in reconstruction the past limits of the central business district and the frame, and in obtaining data on the services offered

by the federal government between 1915 and 1974.

The analysis traced the locational development of the federal office and service system for the period 1915 to 1975 and related spatial change to general changes in Edmonton's central area. The number of offices and the proportion of offices and services found within the central business district were found to rise slowly, over periods of ten to fifteen years, and to ebb less slowly, over a five year period.

The regularity of these changes suggested that the spatial organization of offices and services has also been transformed. The nearest neighbour statistic, centrographic measures and cartographic analysis revealed that offices and services have moved from the CBD into the frame and back into the CBD. The movement of offices is directly related to the metamorphosis of the central area and federal office acquisition and leasing policy.

The central area of Edmonton has always been the locational focus of the federal service system. In 1975, over 80 per cent of all consumer-oriented services were within the central area. The largest federal structures are in the frame, near the CBD. This conforms to the observations in the general literature that government functions tend to occupy sites on the periphery of the CBD. Conversely, a large number of smaller, leased offices are distributed throughout the central business district. In fact, most federal offices and services were within the CBD until 1945 when economic and population growth invoked large scale development and relocation of many general office

functions and low face-to-face contact services from the central business district.

The data for Edmonton suggest that preference for a central area site is based on historical precedent and the attitudes of decision-makers, but that the distribution and arrangement of offices and services is the product of other factors. The process of office acquisition, leasing and discard, in conjunction with the dynamic process of central area change, are manifest in the spatial organization of federal services. In general, a nucleated distribution is typical when offices and services have an opportunity to occupy prime CBD sites. Opportunity exists when competition for available office space and sites is not intense, and when municipal, provincial and general office functions are also within the CBD. During these periods, federal services are in proximity to interrelated services and they are accessible from all points in the city. In Edmonton, the distributions tend towards uniformity when the proportion of central area offices and services in the CBD is high and most new office space is leased from the private sector.

The compact pattern of federal offices and services was broken when improved economic conditions and population growth induced changes in the internal structure and areal limits of the CBD between 1945 and 1965. First offices, then services, followed the westward locational shift of the general office sector and low face-to-face contact services of the private sector. During the period 1965 to 1975, a large number of federal services moved from the CBD to the area surrounding City Hall.

Also, growth of the federal service sector itself created pressure on existing office space. The main federal building, the Edmonton Central Post Office, was unable to accommodate further expansion of federal services. Consequently, greater amounts of leased space had to be obtained to meet federal space demands. The amount of leased space increased until the Federal Building (9820 - 107 Street) was constructed. Between 1958 and 1960, 63 per cent of all central area federal services moved into the Federal building. Relocation caused a substantial reduction in the proportion of federal services found in the CBD and in the total amount of leased space. The spatial consequences of the westward shift of services were a random office pattern within the central area, high concentrations of services within particular office structures, reorientation of the office and service distribution, and greater distance from services to public transportation systems.

After 1965, the Federal Building was unable to accommodate the internal growth of existing departments and the space requirements of newly created departments. The federal government again turned to the general office sector for its space requirements. As in the period before 1945, the location of most new departments and relocation of services from existing offices took place within a short distance of the main federal buildings, the Federal Building and the new Post Office in the northeast sector. Thus, services began to disperse from the Federal Building, whereas offices rented from the general office sector concentrated around three discrete nodes. Only one node, the smallest, is

in the CBD, on Jasper Avenue, south of the former site of the Edmonton Central Post Office.

Although 45 per cent of all central area federal services, and 49 per cent of the offices had located and relocated in leased space and small government-owned structures near the outer edge of the CBD by 1945. The distributions are less agglomerated than prior to 1945, forming multi-nodal clumps within the central area. Since the federal government leases much of its office space from the general office sector which is larger and more extensive than formerly, there is a greater number of alternative offices and office sites for services. The office selection process, which is concerned mainly with securing low cost accommodation, and the horizontal extension of the general office sector into the frame, are the principal components in the present spatial configuration of federal offices.

Accessibility to Consumer-Oriented Services

Accessibility to consumer-oriented services in Edmonton's central area was evaluated qualitatively, by a map analysis of the arrangement of face-to-face contact services; and quantitatively, by measuring the total aggregate straight-line distance from clients to UIC facilities against the distance to optimal locations. Unemployment Insurance Commission was selected as a case study, because its location requirements fit the location-allocation model used in the study. Also, a measure of equity which attempts to reflect the real needs of unemployed persons was accomplished by weighting the cells of a square net grid

population map of Edmonton. The argument upon which the equity weights were derived is that areas which contain large concentrations of unemployed persons for long periods of time have the greatest need for UIC services. It was assumed that proximity to UIC services increases the use and the usefulness of the services, and that areas with high concentrations of UIC clients tend to be the same areas with persistent unemployment.

Nearly one-third of the respondents expressed dissatisfaction with their present location. Complaints, mainly from consumer-oriented services located within the frame, concerned either the lack of parking space or poor bus service. Complaints over bus service arise when the service is more than 600 feet from the nearest bus stop. This was adopted as a rough standard, and the arrangement of services with different levels of face-to-face contact was described with reference to the standard.

On average, services with high levels of face-to-face contact are nearer to high density bus routes than are low face-to-face contact services. The best bus service is in the northeast sector where there are fourteen federal offices. Only five of these offices contain high face-to-face contact services, however. At the same time, some consumer-oriented services in the southwest sector have inadequate bus service.

Federal services west of 103 Street are suboptimally located in relation to bus service. Also the movement of offices and services into the frame implied that some high face-to-face contact services

might be suboptimally located with respect to the distance separating facilities from clients.

Unemployment Insurance Commission, the department selected as a case study, operates from two Edmonton facilities, one north of the North Saskatchewan River (10704 - 102 Avenue), the other on the south side (10452 - 82 Avenue). Most UIC clients are north of the river and the densest concentrations occur around the central area, northeast of the central area to 122 Avenue, and southeast of the Edmonton Industrial Airport along a north-south axis.

The solutions calculated by a location-allocation model, which minimizes the total aggregate straight-line distance separating hard core unemployment areas from UIC facilities, indicate that present facility locations are suboptimal. If both facilities are permitted to relocate; the optimal system is 83.0 per cent of the actual costs. If only the branch office is allowed to move, the optimal facility system functions at 84.2 per cent of the actual costs; but the optimal locations for the latter solution produce larger costs than the global solution.

The optimal locations are nearly identical for both cases. By permitting both facilities to relocate, the main office is moved to 82 Street and 122 Avenue, while the branch office is shifted across the river to a point west of the frame at 114 Street and 98 Avenue. When the present central area office is maintained, the second office is shifted north to 79 Street and 124 Avenue, only a few blocks north of the optimal location for the central area office. For the two facility

system of UIC, the central area is the optimal location, provided that the branch office is relocated on the northside of the river, near 83 Street and 123 Avenue. Otherwise, the central area is a suboptimal location.

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

To date, there has been little geographical research, theoretical or empirical, directed towards the discovery and explanation of the economic, political, and social interrelationships among federal services and other activities, and how these fit into the total urban system. This study has shown how difficult that effort will be. Each theme treated in this thesis should be analysed in greater detail.

Research on location requirements should be broadened to include all the activities engaged in by federal departments. It became obvious from the questionnaire analysis that it is not possible to make simple distinctions, such as consumer-oriented and resource-oriented, and public and non-public, among federal services. Some departments, for example, Public Works, are not properly termed resource-oriented services, and although they may have occasional dealings with the public, they cannot be called consumer-oriented services. Also, departments such as Post Office may offer services with and without direct cost to the client. This suggests that a more rigorous classificatory scheme is needed in public service research.

Also, it is clear that local management, although they are

directly involved in locational decision-making, are not overtly concerned with the details of their locations needs. The choice of alternative office locations is based almost entirely on cost considerations and the location of available space, and not on the functional requirements of services.

The economically rational desire to minimize office costs has certain disadvantages. Since the federal locational system tends toward agglomeration and the multi-purpose office complex, future locational decisions will have even greater impact on the urban environment. When services move from leased space into government-owned structures, relocation is rapid and moves are fairly lengthy. Given the constant growth of the public service sector during the last sixty years, the decision to build a single structure which could accommodate most central area federal services will induce a major re-orientation of movement patterns. Moves of this sort could add to existing transportation and parking problems, create an excessive amount of vacant office space in the general office sector, and produce significant changes in land values. Most important, the choice of a location for the office complex and the allocation of services to it will be critical. Although the basic locational criteria of federal services are broadly similar, they serve different needs which are manifest in the location of their clients. Therefore, it is unlikely that a single location chosen primarily on the basis of cost would satisfy the locational needs of every department which occupies space in the complex. Further research

on the location requirements of, and functional relationships among federal services should be undertaken to reveal the consequences of particular planning decisions, and to establish an ordering of the factors which ought to be incorporated in site selection studies.

Research should be directed towards the development of methods and techniques for analysing the location requirements and the locational system of federal services. This study has shown that the spatial organization of federal offices and services tends to conform to the properties of a system. Thus, systemic inquiry should produce significant contributions in the field of public service research. At the same time, it should also be cautioned that federal services constitute a social system whose structure is continually evolving and adapting to changing political and social conditions. It therefore follows that the preferred locational states of the system will also change as new information and policies are introduced.

Functional analyses of the spatial organization of federal services will require the development of proficient analytical techniques. The nearest neighbour statistic and the centrographic measures are useful descriptive tools when it is possible to define and delimit an area which is representative of the point set under investigation. Furthermore, the point pattern and centrographic measures used in this study are not readily amenable to the intensive inferential treatment needed to explain the relationships among urban structure, the functions performed by federal services, office acquisition and leasing procedures, and the locational system of federal offices and services. Centrographic

measures should also be applied to CBD activities in the private sector to determine precisely which functions are related to the movement of federal services.

It is unlikely that existing location-allocation programs are suitable for federal facility planning. Although accessibility to the public is an important location requirement for most federal services, interrelationships among services and government and private organizations should be taken into account. Moreover, the conceptual and measurement problems associated with the social welfare function, equity, require greater treatment than has been possible in this study and in the available literature. Specific themes could include an examination of the effects which an increase in spatial equity has on the use and effectiveness of services, and to determine the size and number of facilities in an equitable system. Another important line of investigation would be to use location-allocation models to determine alternative locations, compute the costs of each locational variable incurred at these locations, and build the results into a cost-effectiveness scheme. This could be done fairly easily for the accessibility criterion, because the City of Edmonton has information on transit times. In retrospect these should have been used in this thesis to give a more realistic definition of the distance clients must travel to use a facility.

Finally, this study has contributed some useful information on the federal locational system in Edmonton. Since locational decision-making is conducted primarily on the basis of cost considerations, and the availability of leased space, it is likely that the processes

which govern the spatial organization of federal services in Edmonton are similar in other large Canadian cities. Specifically, interrelated federal consumer-oriented services in the central area have become less concentrated and less accessible to their clients because federal offices must follow the direction of growth of the general office sector and low face-to-face contact services from whom they obtain office space. Comparative studies should be undertaken to test the validity of the data for Edmonton. As well, more intensive locational research on the linkages formed among federal services and other central area activities will contribute to an understanding of the internal structure of the central region of cities and the effects of locational decision-making by the federal government.

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APPENDICES

APPENDIX A

PART I

1. Please identify the service(s)* provided by you in the City of Edmonton if the service(s) fulfils the two following conditions:

   i) the service is oriented towards frequent face-to-face contact with members of the public; and

   ii) most face-to-face contact with the public takes place at an office or facility from which the service operates.

*Please group services by name of Branch.

Brief identification of the service(s) provided	Name of Branch
#1	
#2	
#3	
#4	
#5	

Please read carefully.

a. If you provide no service that fulfills conditions i) and ii) above, answer only PART II of the questionnaire; but return PART I, and PART II to this office.

PART I

b. Whenever the sequence #1, #2, #3, #4, #5 occurs in subsequent questions it corresponds to the services you identified in the space #1, #2, etc. above. It is not expected that you necessarily identify services in all five spaces above.

2. What percentage of total public contact for each service is represented by face-to-face contact at an office or facility where the service is provided?

Service:	#1	#2	#3	#4	#5
% face-to-face contact	___	___	___	___	___

3. In terms of each service you provide to the public, some areas of Edmonton might be considered more suitable than other areas of the city for locating an office/facility building from which the service is provided.

a. Rank all six areas listed below in order of their suitability for office/facility locations of the services you identified in Question 1 above.

AREAS

A. attached suburb
B. inner city
C. centre of Edmonton
D. detached suburb
E. urban fringe
F. rural

(Enter the letters (A,B,C,D, etc.) in all six boxes provided to the right of each appropriate service # listed below. A sample answer to this question is given on the last two pages of the questionnaire. Please refer to the sample to ensure that you have interpreted this question correctly).

PART I

	most suitable location	Rank	least suitable location
Services:	#1----------	☐☐☐☐☐☐	
	#2----------	☐☐☐☐☐☐	
	#3----------	☐☐☐☐☐☐	
	#4----------	☐☐☐☐☐☐	
	#5----------	☐☐☐☐☐☐	

b. Are some areas you ranked in Question 3a equally suitable for an office/facility location of a particular service?

Yes No (Go to Question 3c)

(If Yes):

Service (please identify)	Circle the equally suitable locations
# _____	A. B. C. D. E. F.
# _____	A. B. C. D. E. F.
# _____	A. B. C. D. E. F.

c. Why are the most suitable office/facility locations you indicated in Question 3 a. important?

_____

_____

_____

_____

_____

_____

_____

PART I

(If Yes):

Service (please identify)	Circle the equally suitable land use locations
# _____	A. B. C. D. E. F. G. H.
# _____	A. B. C. D. E. F. G. H.
# _____	A. B. C. D. E. F. G. H.

c. Why are the most suitable office/facility locations you indicated in Question 4 a. important?

_____

_____

_____

_____

_____

_____

_____

5. Listed below are activities near which an office/facility of a service might be suitably located.

a. Please rank these activities in order of their suitability for office/facility locations of the services you identified in Question 1. above:

ACTIVITY

A. near other federal government departments
B. near other functions of your department
C. near provincial government departments
D. near municipal government departments
E. near essential urban services
(please specify)_____

PART I

4. Listed below are land use types where an office/facility for a service might suitably be located.

a. Please rank these land use types in order of their suitability for office/facility locations of the services you identified in Question 1 above.

LAND USE TYPE

A. industrial
B. central business district commercial
C. non-central business district commercial
D. residential
E. recreational
F. institutional
G. other? (specify) _____
H. other? (specify) _____

(Enter a letter (A, B, C, D, E, etc.) in the boxes provided to the right of each appropriate service # listed below).

	most suitable location	Rank	least suitable location
Service: #1			
#2			
#3			
#4			
#5			

b. Are some land use types you ranked in Quest. 4 a. equally suitable for an office/facility location of a particular service?

Yes No (Go to Question 4c).

PART I

F. near essential rural services
(please specify)_____
G. Other? (specify)_____
H. Other? (specify)_____

	most suitable activity location	Rank	least suitable activity location
Service:	#1---------	☐☐☐☐☐☐☐☐	
	#2---------	☐☐☐☐☐☐☐☐	
	#3---------	☐☐☐☐☐☐☐☐	
	#4---------	☐☐☐☐☐☐☐☐	
	#5---------	☐☐☐☐☐☐☐☐	

b. Do you feel that some activity locations are equally suitable for an office/facility location of a particular service?

Yes No (Go to Question 5c).

(If Yes):

Service (please identify)	Circle the equally important activities
# _____	A. B. C. D. E. F. G. H.
# _____	A. B. C. D. E. F. G. H.
# _____	A. B. C. D. E. F. G. H.

c. Why are the most suitable activity locations you indicated in Question 5 a. important?

_____

_____

PART I

_____

_____

_____

_____

_____

6.

a. Please rank the following transportation requirements in order of their importance for determining office/facility locations of services you identified in Question 1. above.

TRANSPORTATION REQUIREMENTS

A. rapid transit
B. bus routes
C. railway
D. airport
E. parking (crown-owned and employees' vehicles)
F. parking (clients' vehicles)
G. Other? (specify)_____
H. Other? (specify)_____

most important requirement — Rank — least important requirement

Service:								
	#1----------							
	#2----------							
	#3----------							
	#4----------							
	#5----------							

PART I

b. Do you feel that some transportation requirements are equally important for a particular service?

Yes No (Go to Question 6c).

(If Yes):

Service (please identify)	Circle the equally important requirement
# _____	A. B. C. D. E. F. G. H.
# _____	A. B. C. D. E. F. G. H.
# _____	A. B. C. D. E. F. G. H.

c. Please describe the transportation needs and problems of your services.

_____

_____

_____

_____

_____

_____

_____

7.

a. Rank the following accessibility factors in order of their importance for determining office/facility locations of services.

ACCESSIBILITY

A. for employees' journeys from residence to work
B. for clients who travel to the office/facility
C. to complementary land use types and activities

PART I

D. to points of delivery or pickup
E. Other? (specify) _____
F. Other? (specify) _____
G. Other? (specify) _____

	most important factor			Rank			least important factor
Service: #1------							
#2------							
#3------							
#4------							
#5------							

b. Do you feel that some accessibility factors are equally important?

Yes No (Go to Question 7c).

(If Yes):

Service (please identify)	Circle the equally important factors
#_____	A. B. C. D. E. F. G.
#_____	A. B. C. D. E. F. G.
#_____	A. B. C. D. E. F. G.

c. Please describe fully the accessibility requirements for your services.

_____

_____

_____

_____

PART I

8.

a. Please rank the following general location requirements in order of their importance for determining an office/facility location of services.

GENERAL LOCATION REQUIREMENTS

A. some specific area of the city (inner city, suburbs, etc.)
B. associated land uses (industrial, residential, etc.)
C. associated activities (government functions, etc.)
D. transportation (rapid transit, parking, etc.)
E. accessibility (for employees, clients, etc.)

	most important requirement — Rank — least important requirement				
Service: #1--------					
#2--------					
#3--------					
#4--------					
#5--------					

b. Do you feel that some general location requirements you ranked in Question 8 a. are equally important?

Yes No (Go to Question 9)

PART I

(If Yes):

Service (please indentify)	Circle the equally important factors
#_____	A. B. C. D. E.
#_____	A. B. C. D. E.
#_____	A. B. C. D. E.

9. How closely do the present office/facility locations of services you listed in Question 1. above reflect the general location requirements which you feel are important in Question 8. above?

- very closely ☐
- closely ☐
- fairly closely ☐
- not very closely ☐

(If "fairly closely" or "not very closely", please explain)

_____

_____

_____

_____

_____

_____

_____

10. Do you feel that the services rendered to clients from your present offices/facilities would be improved by adding:

    A. more office/facility location in Edmonton; and/or

    B. more office/facility space in buildings you presently occupy?

PART I

Service (please specify)	A and/or B
#_____	___ ___
#_____	___ ___
#_____	___ ___

11. Which do you feel is presently more important for improving client use of services:

    1. more office/facility locations in Edmonton
    2. more office/facility space in buildings you presently occupy
    3. 1. and 2. equally important
    4. 1. and 2. are unimportant

Please explain: _____

_____

_____

_____

12. What additional information on locating the offices/facilities of services you identified in Question 1. above would you care to bring to light?

_____

_____

_____

_____

PART II

Note: The questions in Part II are based on all Department services which are directly or indirectly under your supervision.

1. When you require a new office/facility in Edmonton, what federal government departments (excluding your department) would usually be consulted regarding the selection of suitable locations?

2. What provincial government departments or agencies would usually be consulted?

3. What municipal government departments or agencies would usually be consulted?

4. What Branch, Division, Section, etc., within your department recommends where new offices/facilities ought to be located?

5. What government department(s) makes the final decision on where your new offices/facilities will be located?

PART II

6.

a. Does your department issue official guidelines stating location requirements which should be met in selecting suitable sites for new offices/facilites?

Yes ☐

No ☐ (Go to Question 8)

(Do not know) ☐ (Go to Question 8)

b. (If Yes):

Please rank the location requirements issued by your department in order of their official importance, if applicable:

Rank		Location Requirements
most important	1.	_____
	2.	_____
	3.	_____
	4.	_____
least important	5.	_____

c. Are the location requirements listed above ranked in order of importance?

Yes ___

No ___

7. Do you feel that the present location of offices/facilities under your supervision in the City of Edmonton closely reflects the location requirements you identified in Question 6 above?

very closely ___

closely ___

PART II

fairly closely ___

not very closely ___

(If "fairly closely" or "not very closely", please explain)

_____

_____

_____

_____

If you answered PART I of the questionnaire you are not required to answer questions 8, 9, 10 and 11.

8. In terms of the services you offer to the public, how would you rate the present location of your offices and facilities in the City of Edmonton?

Excellent ___ Good ___ Fair ___ Poor ___ Very Poor ___

9. Please explain why your present office/facility locations are satisfactory or unsatisfactory.

_____

_____

_____

_____

_____

_____

_____

PART II

10. If your present location is not entirely satisfactory, please describe where in Edmonton or outside Edmonton you would be best located..

_____

_____

_____

_____

_____

11. Please explain how a different office location would improve the services you offer to the public.

_____

_____

_____

_____

_____

Name of Department _____

Department Representative _____

Thank you for your cooperation

APPENDIX B

QUESTIONNAIRE SAMPLE AND RESPONSE RATE

Department	Responded	Refused
Agriculture	X	
Auditor General	X	
Canadian Broadcasting Corportation		X
Central Mortgage and Housing Corporation		X
Consumer and Corporate Affairs	X	
Energy, Mines and Resources	X	
Environment Canada	X	
External Affairs	X	
Health and Welfare	X	
Indian and Northern Affairs	X	
Industry Trade and Commerce		X
Information Canada	X	
Justice	X	
Labour	X	
Manpower & Immigration	X	
National Film Board	X	
Post Office	S	
Regional Economic Expansion		X
Revenue and Taxation		X
Royal Canadian Mounted Police	X	
Secretary of State	X	
Solicitor General	X	
Statistics Canada	X	

Department	Responded	Refused
Transport	X	
Unemployment Insurance Commission	X	
Veterans Affairs	X	
Total	21	5 response rate = 80%

Four departments were not surveyed:

Air Canada, National Defence, Public Works, Supply and Services.